QUANTIFYING POTENTIAL SOURCES OF MICROBIAL CONTAMINATION IN HOUSEHOLD DRINKING WATER SAMPLES

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ABSTRACT

In Virginia, over one million households rely on private water supplies (e.g. well, spring, cistern). Previous literature acknowledges bacterial contamination in private water supplies as a significant public health concern in the United States. The present study tested private wells and springs in 20 Virginia counties for total coliforms (TC) and *E. coli* (EC) along with a suite of chemical contaminants. Sample collection was organized by the Virginia Household Water Quality Program (VAHWQP), a Virginia Cooperative Extension effort managed by faculty in the Biological Systems Engineering Department. Microbial and chemical source tracking were used to identify possible sources of contamination. A logistic regression was employed to investigate potential correlations between TC contamination and chemical parameters (e.g. NO_3^-, turbidity) as well as homeowner provided survey data describing system characteristics and perceived water quality.

TC and EC contamination were quantified via the Colilert (www.idexx.com) defined substrate method for most probable number (MPN) of EC and TC per 100 mL of water. Of the 538 samples collected, 41% (n=221) were positive for TC and 10% (n=53) for EC. Chemical parameters were not statistically predictive of microbial contamination. Well depth, water treatment, and farm location proximate to the water supply were factors in a regression model that predicted presence/absence of TC with 74% accuracy. Microbial and chemical source tracking techniques (Polymerase Chain Reaction (PCR) and fluorometry, respectively) identified 4 of 26 samples as likely contaminated with human wastewater. Application of these source-tracking analyses on a larger scale will prove useful in defining remediation strategies.

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1. LITERATURE REVIEW

1.1 Rural Drinking Water

According to the United States Census Bureau's 2009 housing survey, over 13 million occupied households in the United States rely on private household wells as a primary source of drinking water (Census, 2010). While the Environmental Protection Agency (EPA) regulates water quality for public water supplies, private water supply users are solely responsible for the care and maintenance of their water supply. The EPA drinking water standards for public supply water quality can be used as guidelines when assessing private supply water quality. When levels of selected constituents in household water exceed the EPA guidelines, they may affect human health or be a nuisance (e.g., affect the taste, smell, appearance).

The EPA provides a number of suggestions to homeowners reliant on private water supply systems including specific construction and maintenance procedures that can help to protect against private water supply contamination and preserve water quality. Some of these procedures include annual testing for total coliform bacteria, nitrates, total dissolved solids and pH levels (USEPA, 2002). General levels of compliance with maintenance and operational recommendations are variable and depend on the ability of each private water supply owner to recognize the benefits of these investments (Imgrund *et al.*, 2011). Compliance with routine maintenance and water quality analysis recommendations can also be complicated by ignorance with respect to proper water supply system construction and maintenance and external risks that can adversely affect the quality of water in private water supply systems. Some of these risk factors include improper use of fertilizers and pesticides, leaking septic tanks or underground storage tanks, storm-water runoff and faulty water supply system construction.

However, the fact that private water supply owners are responsible for their own water quality testing presents a potential public health disparity. A significant percentage of private water supply owners in the United States live in rural regions where there is generally less access to the education and/or financial resources necessary to address water quality issues unique to private water supplies (Wescoat *et al.*, 2007). According to data collected and analyzed by the US Centers for Disease Control, the proportion of waterborne disease outbreaks associated with non-community groundwater water supply systems has increased from 1976 to 2006 (Craun *et al.*, 2010). While this suggests a significant public health issue of potentially increasing concern, there is little related research, perhaps due to the flawed perception that the U.S. has universal access to proper drinking water supply and sanitation (Wescoat *et al.*, 2007).

1.2 Previous Efforts in Surveying Rural Drinking Water Quality

A limited number of studies have been performed over the past several decades investigating the quality of private water supply in the United States. The prevalence of contamination with coliforms and *E. coli* was analyzed in most of these studies, along with the relationships between contamination and causal factors related to water supply system construction, land use and knowledge of water quality issues. Although studies have not been consistent in their ability to correlate private water supply contamination with predictive factors, they all provide evidence that private water supply systems are susceptible to contamination given the significant percentage of total coliform positive samples on the whole. Table 1-1 shows previous studies indicating the percent of water samples positive for total coliforms in homes served by private drinking water supplies. Bacterial contamination of private drinking water appears to be remarkably common given that the majority of these studies found rates of contamination of at least 25%, with some greater than 50%.

Table 1-1. Summary of previous private drinking water studies.

Study	Location	Percent TC +ve	Total # Sources
Sandhu *et al.* 1979	South Carolina	85%	460
Lamka *et al.* 1980	Oregon	35%*	78
Sworobuk *et al.* 1987	West Virginia	68%	155
Bauder *et al.* 1991	Montana	40%	1300
Kross *et al.* 1993	Iowa	45%	686
Gosselin *et al.* 1997	Nebraska	15%**	1808
Borchardt *et al.* 2003	Wisconsin	28%	50

*Percent of samples positive for coliforms, fecal coliforms, *S. aureus*, or with standard plate counts exceeding 500/mL
**Percent of samples with "bacterial contamination" (not necessarily TC)

Factors associated with water supply system construction and maintenance as well as local environmental factors may affect whether or not a private water supply system is contaminated with bacteria. For example, lack of proper well sealing (i.e. grout around the casing or well cap seal) has been correlated with higher total coliform densities in private wells (Lamka *et al.*, 1980; Sworobuk *et al.*, 1987). This is to be expected based on the opportunity for surface water infiltration when wells are not properly sealed. In theory, a deep well should also have superior quality to a shallow well because of an increase in natural filtration with depth.

However, aquifer contamination itself can compromise the quality of source water (USGS, 2009). In general, shallow wells have been correlated with higher total coliform densities (Sworobuk *et al.*, 1987). Some other factors that have been associated with bacterial contamination of private water supplies are improper system placement with respect to potential contamination sources, proximity of grazing animals, and lack of knowledge as to the significance of contaminated water (Lamka *et al.*, 1980).

Attempts at linking private water supply type with bacterial contamination have been inconsistent. When 460 samples were analyzed in South Carolina from wells (drilled, dug, hand-drawn and artesian) and springs, no correlation was found between system type and level of bacterial contamination (Sandhu *et al.*, 1979). In 1984, however, the USEPA found that out of 2,100 systems, non-well private water supply systems (including springs and cisterns) *did* have a significantly higher rate of total coliform contamination (USEPA, 1984). In another water quality survey performed by the Centers for Disease Control and Prevention, bored and dug wells (typically much shallower than drilled wells) were significantly more likely to contain total coliform bacteria than drilled wells (CDC, 1998). More research is needed in order to conclude that particular system types are more or less susceptible to bacterial contamination, and whether this susceptibility is inherent to system design, typical maintenance, or geographic factors.

Of the water quality studies acknowledged in Table 1-1, there was no standard procedure for methodology in terms of participant selection, sample collection, or analytical technique. Studies associated with Cooperative Extension programs and land grant universities obtained samples through voluntary participation by residents of a state or county (Bauder *et al.*, 1991), as opposed to other studies in which participants were randomly selected to represent a greater population (Sandhu *et al.*, 1979; Sworobuk *et al.*, 1987; Kross *et al.*, 1993; Gosselin *et al.*, 1997). Lack of a consistent water sampling protocol can also cause ambiguity in survey results. Samples taken at the point-of-use (e.g. indoor tap) do not distinguish between contamination originating with groundwater source and contamination originating within the household plumbing system. However, samples taken at the point of extraction (e.g. well-head) do not necessarily represent homeowner exposure at the point-of-use. Many studies do not specify sample collection procedures, rendering an understanding of the implications of their results difficult (Sworobuk *et al.*, 1987; Bauder *et al.*, 1991; Kross *et al.*, 1993). Analytically, several methods were used for bacterial enumeration including Colilert, membrane filtration, and multiple tube fermentation. Considering the somewhat “dated” nature of these studies, it is not surprising that the results of bacterial enumeration by culture-based techniques has not been compared with results using molecular tools such as PCR.

Studies that characterize bacterial contamination in private drinking water supplies generally report concentrations of total coliforms and *E. coli*. Total coliforms are indicators of general bacterial contamination, but not necessarily fecal contamination, because they are found in the environment and not exclusively in the gut of warm-blooded animals. Fecal coliforms are a subset of total coliforms that are considered to be present exclusively in the gut and feces of warm-blooded animals. In drinking water samples, the presence of *E. coli*, a major species of fecal coliforms, indicates probable contamination by feces of warm-blooded animals and hence the potential presence of human pathogens.

1.3 Water Quality Monitoring

1.3.1 Indicator Organisms

While many pollutants in drinking water can pose a threat to human health, such as nitrates, pesticides, heavy metals, protozoa and viruses, selected bacteria are commonly used as water quality indicators. The presence of bacterial pathogens in groundwater has been linked to human illness, most commonly acute gastrointestinal illness (AGI) (Raina *et al.*, 1999; Macler and Merkle, 2000).

Direct monitoring for waterborne human pathogens is often impractical due to the wide variety of targets, low concentrations, and the high cost of laboratory analysis. Therefore, monitoring strategies are based heavily on the detection of "indicator organisms" (IOs) as opposed to the direct detection of pathogens. These organisms are used as targets based on their presence in the intestines of warm-blooded animals and therefore serve as indicators of fecal contamination (Suau *et al.*, 1999). It is important to note that the presence of IOs in drinking water does not necessarily indicate that particular pathogens are present; rather, it is used as evidence to assess the risk of human illness along with the type and level of exposure to contaminated water. Because drinking water is ingested in relatively high volumes, this exposure route is of particularly high concern. To reduce the probability of illness, the EPA currently recommends that municipal drinking water maintain a zero maximum contaminant level for *E. coli* and contain no more than 5.0% of samples positive for total coliforms in a month for systems being tested more than 40 times per month, or no more than one sample positive for total coliforms for systems being tested less than 40 times per month (EPA, 2011). While these EPA regulations do not apply to private water supply, they can still be used as water quality guidelines for private water supply system owners. For example, the VAHWQP recommends a retest when TC is present and recommends system disinfection when *E. coli* is present.

1.3.2 Analytical Techniques for Indicator Organism Detection

There are several methods that can be used to quantify IOs in water samples. The methods fall into two main categories: (i) culture based methods and (ii) molecular methods. Traditionally, culture-based methods have been used to detect IOs in drinking water samples. These methods are based on the provision of a substrate specific for the growth of particular IOs. Quantification of IOs has been measured in terms of either colony forming units (CFUs) or most probable number (MPN) of organisms per 100 mL (Hurley and Roscoe, 1983) in order to estimate the presence of pathogens. However, there are several flaws in culture-based methods, including but not restricted to (i) the inability to detect bacteria that are viable but nonculturable (VBNC) and that still may be infectious (Oliver, 2005), (ii) the time it takes to culture the bacteria (approximately 24 h), and sensitivity to error during culturing (Field *et al.*, 2003). Due to these issues, there has been a recent shift in research towards using molecular based methods for the detection of IOs, particularly in recreational water quality monitoring (Boehm, 2009).

Molecular methods offer various advantages over culture-based techniques, including the ability to detect VBNC organisms, faster results, and the elimination of culturing bias. Some of the methods currently employed are length-heterogeneity polymerase chain reaction (LH-PCR) (Bernhard and Field, 2000b), terminal restriction fragment length polymorphism (T-RFLP) (Bernhard and Field, 2000b), and quantitative polymerase chain reaction (qPCR) (Savichtcheva and Okabe, 2006). In particular, qPCR has been successfully utilized in order to relate exposure to IOs to gastrointestinal (GI) illness in recreational freshwater. In two studies, this relationship was characterized using *Enterococcus* as an indicator of fecal contamination by PCR amplification of a genus specific DNA sequence (Wade *et al.*, 2006; Wade *et al.*, 2008).

Molecular methods also come with inherent disadvantages. While the ability of these methods to detect VBNC organisms can be considered an advantage, it must also be noted that PCR tools do not have the ability to distinguish between living and dead organisms because target DNA sequences will be amplified whether or not they are from a living or dead organism. Because dead organisms do not necessarily indicate recent contamination, qPCR results that include DNA from both living and dead organisms can misrepresent the water quality and accompanying health risk at the time of sampling. Research has shown that PCR can detect DNA that persists in environmental conditions that do not give culture-positive results (Deere *et al.*, 1996). A better indication of viability would require methods that induce some type of response from a living cell (Keer and Birch, 2003), or any treatment to eliminate non-viable DNA. Since the relationship between culture-based methods and molecular methods has not been clearly defined, further investigation is required before promoting molecular methods for use in monitoring drinking water quality standards.

1.4 Source Tracking

Microbial source tracking (MST) is a method used to determine a specific source of contamination in the case of fecal indicator presence. Knowledge of the source of contamination is helpful in determining the most efficient method(s) of remediation. While host specificity (source) can be broken down to the level of species, broader host classifications can be used as well. For example, fecal indicator bacteria such as *E. coli* and *Enterococci* imply general fecal contamination (Farnleitner *et al.*, 2010), whereas other organisms can be chosen as indicators of specific hosts such as horses, dogs, birds or other wildlife.

Analytical MST methods are either culture-dependent or culture-independent. Culture-dependent methods require the formulation of some growth medium and have fallen out of favor due to the difficulty of maintaining consistent experimental conditions for growth. Culture-independent methods often require the use of molecular tools (commonly PCR) to target and amplify genetic sequences that are particular to the host. DNA probes have been designed to target 16S rRNA gene sequences because these sequences are highly conserved and contain source-specific information (Kreader, 1995; Kildare *et al.*, 2007). LH-PCR and T-RFLP are two methods that have been successfully utilized for this purpose (Bernhard and Field, 2000a). Recently, *Bacteroides* spp. have been used as indicators of human fecal contamination because (i) the most prevalent *Bacteroides* spp. found in the human gut are specific to humans (Allsop and Stickler, 1985), and (ii) *Bacteroides* are obligate anaerobes, so they should theoretically indicate recent contamination (Fiksdal *et al.*, 1985). While other organisms have been considered as indicators of human contamination using this method, such as *Bifidobacterium* (Matsuki *et al.*, 2004) and *Faecalibacterium* (Zheng *et al.*, 2009), *Bacteroides* spp. is most commonly used.

Chemical source tracking is often utilized in conjunction with bacterial source tracking in order to provide further clues towards the source of contamination to a particular water body. Some chemicals that have been studied as indicators of anthropogenic contamination are caffeine (Buerge *et al.*, 2003), fecal sterols (Elhmmali *et al.*, 1999), bile acids (Elhmmali *et al.*, 1999), optical brighteners (Close *et al.*, 1989), and polycyclic aromatic hydrocarbons (PAHs) (Standley *et al.*, 2000). Optical brighteners are particularly useful in identifying sources of rural groundwater contamination because they are often contained in septic tank wastewater. Optical brighteners are found in laundry detergents, bleached toilet paper, and other products that readily pass through household drains. Several field studies have successfully used optical brighteners to help indicate sources of anthropogenic contamination (McDonald *et al.*, 2006; Dickerson Jr *et al.*, 2007; Hartel *et al.*, 2008).

Previous source tracking efforts have mainly classified contaminant sources in coastal waters (Brownell *et al.*, 2007; Dickerson Jr *et al.*, 2007), recreational waters (Brownell *et al.*, 2007), and urban surface water (Jiang *et al.*, 2007; Ram *et al.*, 2007). These studies are often related to TMDL development, in keeping with the US Clean Water Act (Hagedorn *et al.*, 1999; Santo Domingo *et al.*, 2007). Because source tracking targets in public distribution systems are generally below detectable levels, MST studies associated with drinking water systems are extremely limited.

1.5 Conclusions: Need for Research in Private Well Water Contamination

Based on results of previous studies, contamination of private water supplies with indicators of bacterial contamination is a significant concern in the United States. Most research on water quality, however, is focused on public water supply systems because these systems affect larger populations in the United States. Information on private water supply is also limited because records of well construction, treatment, or testing are limited and typically kept by the private water supply owner, if at all. The present study will serve to highlight contamination of private water supplies in the United States as a public health issue, and will hopefully shed light on sources of microbial contamination that may inform appropriate strategies for remediation.

This study is of an observational nature, as opposed to being controlled or randomized. This means that no private water supply owners have been “assigned” a particular treatment in order to analyze its effect on their water quality.

Controlled and/or randomized studies are common in scientific investigations, particularly in the field of epidemiology, in which case they are used to prove or disprove relationships between given treatments and their respective health outcomes. These types of studies are intensive and generally require a great amount of time, money and analysis. The advantage of the present study is that, although less controlled than a randomized study, it provides the educational aspect of giving homeowners who rely on private drinking water supplies the knowledge to properly deal with water quality issues in the future. Homeowners, in turn, spread this knowledge to others through reported educational contacts. This method takes on more of a public health approach, by which upstream thinking in the form of preventative education is used to address the root of water quality issues in private water supply systems.

The novelty of using source-tracking methods to address private water quality is by no means a testament to their inability to be useful in formulating remediation strategies for private water supply system owners. They have simply gone unexplored as potentially useful tools for this application. Assays have been developed and successfully used to distinguish between human and non-human sources of fecal contamination in estuaries, rivers and coastal waters. One possible drawback of using this method to assess private water supply water quality is that it is possible that samples will not contain a significant concentration of DNA from their respective contamination sources to be detected. If enough water can be filtered to obtain a substantial quantity of DNA, source-tracking methods should prove to be just as effective as they are in other applications.

2. RESEARCH GOALS

Three major topics were investigated in this study, including the prevalence of private water supply contamination with indicator bacteria, sources of contamination, and the relationships between bacterial contamination and indicative factors. The percent of private water supplies that tested positive for indicator bacteria was documented, with hopes that the results were consistent with previous research, supporting the idea that contamination of private drinking water supplies is a significant problem in the United States.

Chemical and bacterial source tracking were used for the analysis of private water supply systems in order to look for clues as to the local source of contamination, allowing for residents to address fecal contamination more effectively. Finally, a statistical analysis of the relationships between bacterial contamination of private drinking water supply and indicative factors was performed with the goal of aiding in preventative strategies to avoid bacterial contamination and in the identification of drinking water systems that could be at high risk for contamination.

Specifically, the research objectives were to:

1. **Quantify bacterial contamination (total coliforms & *E. coli*) in selected VAHWQP samples and compare results with previous studies**
2. **Determine any statistical correlations between bacterial enumeration, chemical and chemical analyses, and homeowner survey data from VAHWQP samples**
3. **Using the literature, identify an appropriate target to distinguish between human and non-human sources of fecal contamination using microbial source tracking**
4. **Determine primary sources of observed fecal contamination via analysis for a human and non-human marker of fecal contamination**

3. EXPERIMENTAL METHODS

3.1 Sample Collection

Water samples assessed for this research project were collected through the Virginia Household Water Quality Program (VAHWQP). The VAHWQP was founded in 1989 by Virginia Cooperative Extension faculty within the Biological Systems Engineering Department at Virginia Tech. The program works with local Virginia Cooperative Extension educators to provide statewide water quality testing at a reduced cost to homeowners who depend on private water supply systems, as well as education on these systems. One way the program provides outreach is through local, county-based drinking water clinics.

Drinking water clinics begin with an initial kickoff meeting where participants learn about potential local water quality issues. Sample kits are distributed. Samples are analyzed for *E. coli* and total coliforms as well as pH, conductivity [proxy for total dissolved solids], nitrate-N, chloride, fluoride, calcium, magnesium, sodium, sulfur, manganese, copper, iron, sulfates, and hardness for a cost of $45. The water sampling kit includes (i) instructions on how to properly collect water samples, (ii) a survey with questions aimed at identifying possible water quality issues, local sources of contamination and homeowner perception of water quality, and (iii) three sample bottles—one bottle for chemical analysis (250 mL) and two bottles for bacterial analysis (1x100 mL & 1x250 mL). The two bottles used for bacterial analysis are for the quantification of total coliforms and *E. coli* (100 mL bottle) and for filtering in preparation for microbial source tracking (250 mL bottle). Participants are instructed to retrieve samples from a non-swivel faucet on the morning of the scheduled local sample collection date and to keep samples on ice during delivery to a rally location. Samples are collected by a county extension agent, put on ice in a cooler and immediately transported to Virginia Tech for analysis. Depending on the distance of the target county from Blacksburg, bacterial analysis occurs between 8-12 hours of collection. The drinking water clinic concludes with an “interpretation meeting” that occurs approximately one month later. At this meeting, participants receive their sample analysis results. The local extension agent, with support from on-campus faculty, leads a discussion on the clinic results as a whole, as well as with individual participants as needed.

The present study considers data from VAHWQP drinking water clinics conducted during the 2011 calendar year (Figure 3-1).

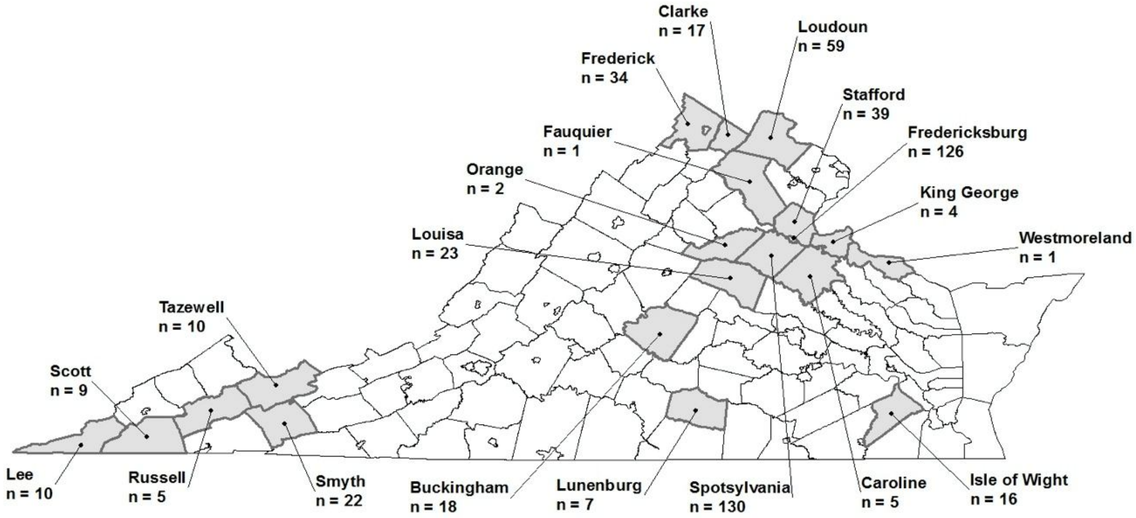

Figure 3-1. Map of counties in which VAHWQP samples were taken for the present study.

3.2 Sample Processing

A total of 538 samples were processed during this study. Several analyses were performed, each on a subset of this total number of samples (Figure 3-2). Due to an unexpectedly high volume of samples received during the clinic that included Caroline, Fauquier, Fredericksburg, King George, Louisa, Spotsylvania, and Stafford counties, n=181 samples were analyzed for presence/absence only. None of the samples from this clinic were filtered for PCR analysis. Therefore, the total number of filtered samples was n=207 (38% of total samples). Of these filtered samples, microbial source tracking (PCR) was performed on the *E. coli* positive samples (n=26).

Of the 538 total samples, 372 were analyzed using a fluorometer in order to determine the relative presence of optical brighteners in the water. Because the results of the initial clinics showed a significant number of total coliforms and *E. coli* positive samples, fluorometry was added to the sample analysis procedure for a more in-depth investigation of possible contamination sources. Statistical analysis was performed on the entire dataset (n=538).

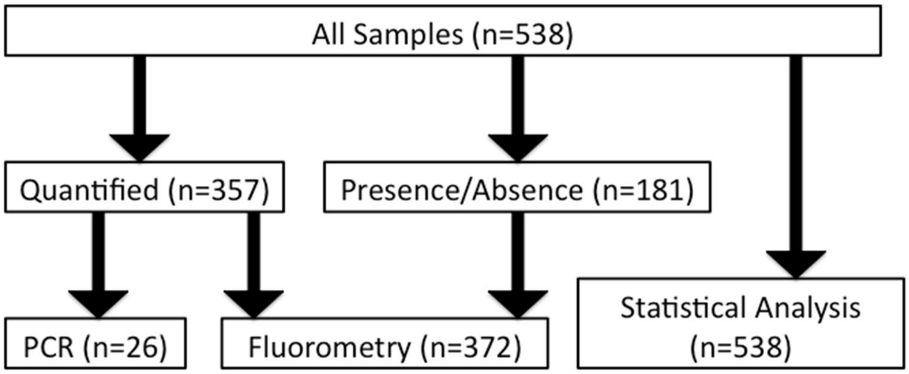

Figure 3-2. Sample processing flowchart.

3.3 Culture-based Bacterial Analysis

All chemical and bacterial analyses were performed at Virginia Tech. Culture-based enumeration of total coliforms and *E. coli* was performed on the 100 mL samples using the IDEXX Colilert 2000 method. The Colilert method has been proven to offer detection comparable to that of simple membrane filtration and growth on selective media, but with faster results (Cowburn *et al.*, 1994). Colilert reagent was poured into each sample and the sample was inverted approximately 20 times for sufficient mixing. The mixture was then poured into an IDEXX Quanti-Tray, sealed using an IDEXX Quanti-Tray sealer (IDEXX Laboratories, Inc., Westbrook, ME), and incubated at 35°C for 24 hours prior to analyst interpretation. A well was considered positive for total coliforms if it turned a dark shade of yellow as compared to a standard. A well was considered positive for *E. coli* if it fluoresced under UV light. Figure 3-3 shows an IDEXX tray (left) that is positive for total coliforms. The numbers written on the side of the tray represent the number of large wells and small wells that are considered positive. Also shown in the photo on the right are two bottles—the yellow bottle (left) indicating the presence of total coliforms and the clear bottle (right) indicating the absence of total coliforms. The growth of *E. coli* was characterized in the same manner, but was indicated by fluorescence when observed in the presence of UV light. Most probable number (MPN) per 100 mL concentrations were determined using a statistical formula provided by Hurley & Roscoe (1983).

Water samples that were positive for *E. coli* were confirmed by growth on eosin methylene blue (EMB) agar. Shiny, green metallic colonies indicate the presence of *E. coli*. Figure 3-4 is an example of an EMB plate that was positive for *E. coli*. Figure 3-5 is an example of an EMB plate that had pink growth instead of green metallic growth, which indicates the presence of *Enterobacter*. *Enterobacter* and *E. coli* are both coliforms that grow on EMB agar. In the case of pink growth, *Enterobacter* has outcompeted *E. coli* for growth on the plate, or *E coli* was not present.

Water samples were also monitored for heterotrophic plate count (HPC) on plate count agar (PCA) in order to observe the general bacterial flora. The “standard” or threshold used to assess water quality based on HPC is 500 bacterial colonies per milliliter (EPA, 2002). Any count that exceeds this threshold indicates that there is a variety of bacteria present greater than that which would be appropriate for “potable” water. Heterotrophic plate counts from VAHWQP water samples can be found in Appendix B. While some of the plates had numbers of colonies that were too few to count, a significant number of samples exceeded 500 colony-forming units (CFU) per milliliter, while many were too numerous to count. Figure 3-6 shows a PCA plate representative of several different types of growth. The white filamentous colony that is spreading across the top right section of the plate is *Bacillus mycoides.* Most other organisms present are *Pseudomonas spp.* which can be identified by shiny white and yellow colonies.

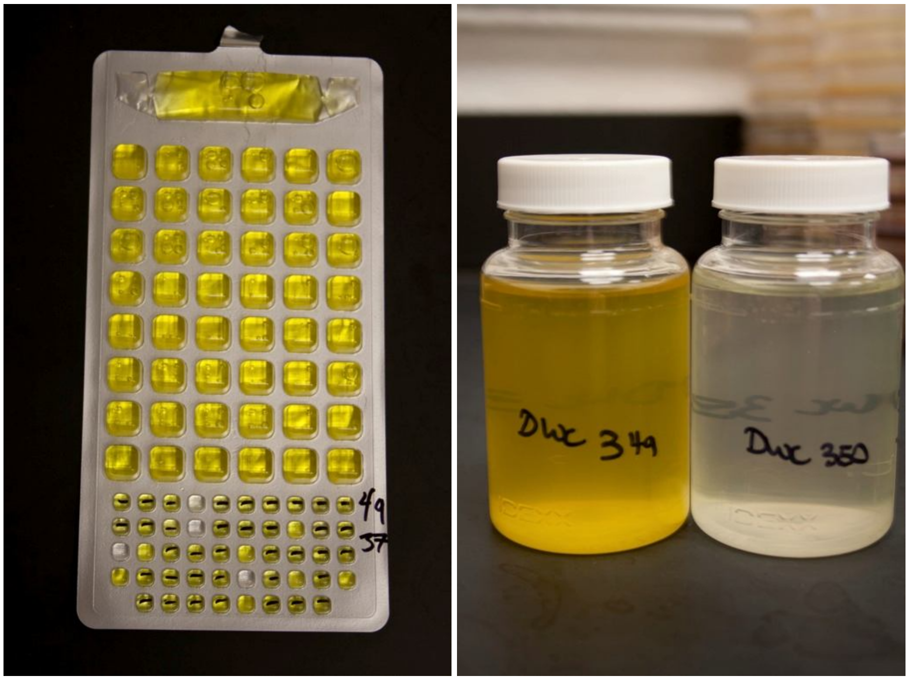

Figure 3-3. IDEXX tray (left) and IDEXX bottles (right).

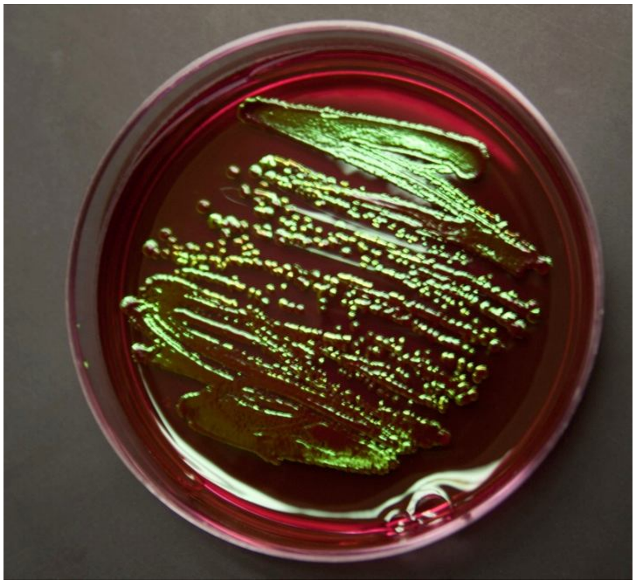

Figure 3-4. EMB agar used for confirmation of *E. coli* presence.

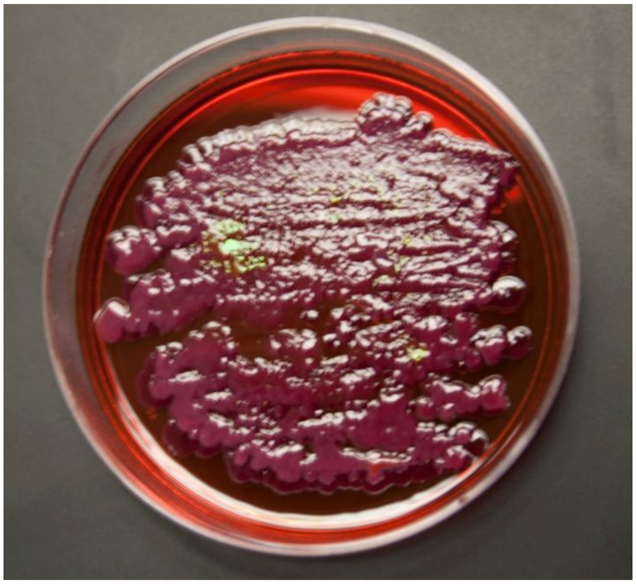

Figure 3-5. EMB agar used for confirmation of *E. coli* presence.

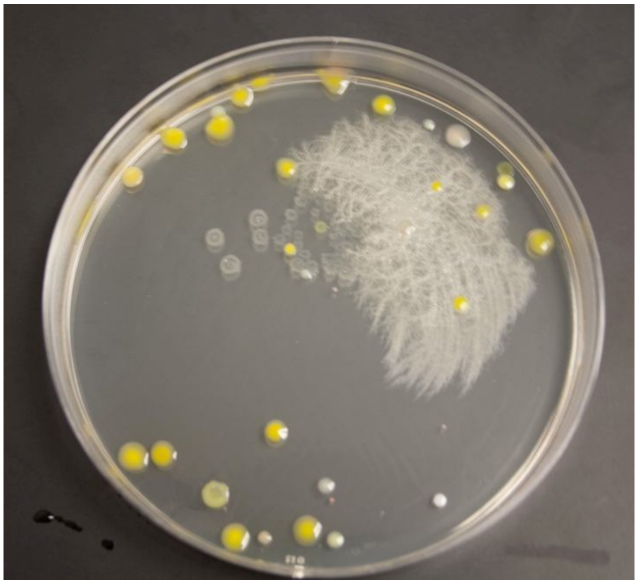

Figure 3-6. PCA plate showing growth of various types of bacteria.

3.4 Filter Capture for Molecular Analysis

Samples filtered for molecular analysis (microbial source tracking) included those from Buckingham, Clarke, Frederick, Lee, Loudoun, Lunenburg, Russell, Scott, Smyth and Tazewell counties. Filtering was performed between 24 and 36 hours of sample arrival. Samples were refrigerated until filtering was performed.

Figure 3-7 shows the experimental setup for filter capture. All appropriate equipment was autoclaved for 20 minutes at 121°C, including 1000 mL of flush water (8). The hood was sterilized with ethanol (5). A sterilized 0.4 µm Isopore membrane filter (Millipore, Billerica, MA) (7) was placed in the filtering funnel (6) using tweezers sterilized by an ethanol candle (5). Using a pipet-aid (Drummond Scientific Co., Broomall, PA) (1) and a 25 mL pipet (2), 250 mL of sample (3) was pipetted into the top portion of the filtering funnel. Then, a vacuum pump (Gast Manufacturing, Inc., Benton Harbor, MI) (9) was used to pull the water through the filter and into the waste flask beneath the filtering funnel. Once the 250 mL of water was pulled through, a small amount of flush water was sent through the filter funnel. Using the tweezers, the filter was removed from inside the filtering funnel and placed in a CryoTube vial (NUNC A/S, Roskilde, Denmark) (4). The CryoTube vials were then stored in a freezer at -80°C until the molecular analysis was performed.

Figure 3-7. Experimental setup for filter capture.

3.5 Chemical Analysis

As part of the typical VAHWQP drinking water clinic, all samples were tested for pH, conductivity [proxy for total dissolved solids], nitrate-N, chloride, fluoride, calcium, magnesium, sodium, sulfur, manganese, copper, iron, sulfates, and hardness. These results were graciously provided to this study by the VAHWQP and were used for the statistical determination of relationships between chemical and bacterial analyses, which will be discussed in the statistical analysis section.

3.6 Questionnaire Data

In addition to their water quality samples, each VAHWQP drinking water clinic participant completed and provided a questionnaire that included specific questions about their water supply including system characteristics, perception of water quality, and proximity to possible sources of contamination. This information was provided by VAHQWP for comparison with indicator organism results. The VAHWQP questionnaire can be found in Appendix A.

The first portion of the survey had questions related to the water source and system characteristics. System type was broken down into springs, cisterns, and wells. If "well" was chosen as the system type, the participant was asked to specify between a dug or bored well and a drilled well, and to provide the depth of the well. The participant was then asked to specify what type of water treatment they used, if any. Device types listed on the survey were (i) water softener, (ii) iron removal filter, (iii) automatic chlorinator, (iv) acid water neutralizer, (v) sediment filter, and (vi) activated carbon filter. There was also an option to specify another type of device. This was followed by a question regarding the location of the home, the options including (i) on a farm, (ii) on a remote, rural lot, (iii) in a rural community, and (iv) in a housing subdivision. Finally, there were two questions about the water distribution system, specifically the type of piping material and whether there were problems with corrosion or pitting of pipes or plumbing fixtures.

The second portion of the survey focused on water characteristics. The first set of questions asked if the water had an unpleasant taste, objectionable odor, or unnatural color, if the water stained any plumbing fixtures or appliances, and if there were any visible particles suspended, settled or floating in a glass of water. The purpose of these questions was to determine if any physical properties of the water were able to indicate the presence of contamination with bacteria or chemicals. Finally, there were two questions that asked whether there were possible sources of contamination located within a particular distance from the water supply system. The first question asked whether a septic system drain field, pit, privy, outhouse, cemetery, home heating oil storage tank, pond, freshwater stream, tidal shoreline, or marsh was located within 100 feet of the drinking water supply system. The second questions asked whether a landfill, illegal dump, active quarry, abandoned quarry, golf course, field crop/nursery, manufacturing/processing operation, farm animal operation, or commercial underground storage tank or supply line was located within ½ mile of the drinking water supply system.

3.7 Microbial Source Tracking

Of the samples that were filtered for molecular analysis, those that were positive for *E. coli* (n=26) were used for microbial source tracking (Figure 3-2). The *E. coli* positive samples were used for microbial source tracking because total coliforms do not necessarily indicate fecal contamination, whereas *E. coli* are fecal coliforms that generally indicate contamination from mammals.

Bacteroides spp. were used as indicators of fecal contamination and were detected by amplification using end-point PCR followed by gel electrophoresis for the identification of PCR products. The Bac32F forward primer and Bac708 reverse primer were used to detect the general presence of *Bacteroides* (Bernhard and Field, 2000b), while the HF183 forward primer and Bac708 reverse primer were used to detect human-specific *Bacteroides* (Bernhard and Field, 2000c). Because primers can be regionally specific, the HF183 forward primer was chosen because it has been used successfully for this procedure in the past in Dr. Charles Hagedorn's Virginia Tech microbial source tracking research lab (Charles Hagedorn, Personal Communication, 2011). Each sample was run once for general *Bacteroides* and once for human specific *Bacteroides* in order to differentiate between human and animal sources.

DNA extraction was performed according to the QIAamp DNA Stool Handbook, under the "Isolation of DNA from Stool for Pathogen Detection" protocol (QIAGEN Inc., Valencia, CA). The filters that contained the captured bacteria from each sample were placed in a 2 mL microcentrifuge, and 1.4 mL of Buffer ASL was added to each tube. The tubes were vortexed for 1 minute or until completely homogenized. Samples were then heated for 5 minutes at 70°C to increase total DNA yield and aid in lysis of bacteria and parasites. After heating, samples were vortexed for 15 seconds and centrifuged at full speed for 1 minute to pellet the stool particles. Then, 1.2 mL of the supernatant was pipeted into a new 2 mL microcentrifuge tube and the pellet was discarded. In the new tube, 1 InhibitEX tablet was added and the sample was vortexed for 1 minute or until the tablet was completely suspended. The suspension was incubated at room temperature for 1 minute to allow inhibitors to adsorb to the InhibitEX matrix. The sample was then centrifuged at full speed for 3 minutes to pellet the inhibitors bound to the matrix. All the supernatant was pipeted into a new 1.5 mL microcentrifuge tube, the pellet was discarded, and the sample was centrifuged at full speed for 3 minutes. Fifteen µL of proteinase K was pipeted into a new 1.5 mL microcentrifuge tube, along with

200 µL of supernatant that was previously pipeted into the other new 1.5 mL microcentrifuge tube. 200 µL of Buffer AL was added and the sample was vortexed for 15 seconds. Samples were then incubated at 70°C for 10 minutes. After incubation, 200 µL of ethanol was added to the lysate and mixed by vortexing. The lid of a new QIAamp spin column was labeled and placed in a 2 mL collection tube. The complete lysate from the previous step was applied to the spin column, the cap was closed and the sample was centrifuged at full speed for 1 minute. The spin column was then placed in a new 2 mL collection tube while the tube containing the filtrate was discarded. The spin column was opened and 500 µL of Buffer AW1 was added. The sample was centrifuged for 1 minute at full speed and then spin column was removed and placed into a new 2 mL collection tube, the old collection tube again being discarded. 500 µL of Buffer AW2 was added to the spin column, and the sample was centrifuged for 3 minutes at full speed. The collection tube containing the filtrate was discarded. The spin column was placed into a new 2 mL collection tube, the old collection tube with the filtrate was disarded, and the sample was centrifuged at full speed for 1 minute. The spin column was transferred to a new, labeled 1.5 mL microcentrifuge tube and 200 µL of Buffer AE was pipeted directly onto the QIAamp membrane. The sample was incubated for 1 minute at room temperaute and centrifuged for 1 minute at full speed to elute DNA. Samples were then stored at -80°C until amplification.

The components of each PCR tube were 12.5 µl Promega PCR Mix (Promega, Madison, WI), 1 µl BSA, 1 µl forward primer (Invitrogen, Grand Island, NY), 1 µl reverse primer (Invitrogen, Grand Island, NY), 7 µl nuclease free water, and 2.5 µl template DNA. The PCR protocol shown in Table 3-1 was followed, using an Eppendorf Mastercycler personal gradient thermocycler (Eppendorf, Hamburg, Germany).

Five µl of PCR product was mixed with 2 µl of 6X running dye and pipetted into a 1% agarose gel which was run at 120 V for 45 minutes in cold 1X TAE. The gel was then stained for 20 minutes using 2 µl of 10,000X SYBR green in 20 mL of 1X TAE. The stained DNA was then visualized under UV light. Photos of each gel were taken using a built-in SLR camera.

Table 3-1. PCR protocol

Bac32F/Bac708		HF183/Bac708		Cycles
T °C	Time	T °C	Time	
95	5 min	95	5 min	1
94	1 min	94	30 sec	35
53	1 min	59	1 min	
72	1.5 min	72	2 min	
72	5 min	72	10 min	1

3.8 Chemical Source Tracking

Of the 538 total samples, 372 were analyzed using a fluorometer in order to determine the relative presence of optical brighteners in the water (Figure 3-2). Upon initial sample processing, 15 mL of water from each sample was poured into a small test tube. These test tubes were put into racks and stored in a refrigerator without exposure to UV light until fluorometry was performed. Due to the sensitivity of optical brighteners to UV light, false negatives can occur if the samples are pre-exposed to UV light before analysis, causing the optical brighteners to break down and become undetectable. Analysis was performed using a 10 AU

Fluorometer (Turner Designs, Sunnyvale, FL). Test tubes were individually placed into the fluorometer and within 10 to 15 seconds the instrument displayed readings automatically. Based on historical data from the same instrument (C. Hagedorn, personal communication, May, 2011), the threshold for a positive result was determined to be in the range of 50-100. Results of this test can be obscured by fluorescing organic compounds in the environment (Hartel *et al.*, 2007). Therefore, all positive samples were held under ultra-violet light for 4 hours to degrade optical brighteners and allow for differentiation between optical brighteners and fluorescing organic compounds. A positive result was confirmed if the reading decreased by approximately 30% of the original value (Hartel *et al.*, 2007).

3.9 Statistical Analysis

All statistical analyses were performed using JMP 9 Statistical Software (SAS Institute, Inc., Cary, NC). The goal of the statistical analysis was to determine if any of the data retrieved from either the sample surveys or the results of the chemical analysis could be useful in predicting whether a given well was contaminated with bacteria. A logistic regression model was used to combine several predictive factors into one equation that predicted the presence or absence of total coliforms.

The dependent variable in this analysis was total coliform concentration (MPN/100 mL). This variable was chosen over *E. coli* concentration because the dataset for *E. coli* density was so zero-heavy (e.g. 90% of samples negative for *E. coli*) that there was not enough numerical data to employ reliable statistical techniques to analyze predictive relationships. Using total coliform concentration as the dependent variable for further investigation, a cluster analysis was performed to determine if it was appropriate to break down the response into "levels" of contamination, where each level represented a division of the total range of MPN/100 mL concentrations. The cluster analysis revealed that the only two appropriate levels were "zero" and "non-zero." This is likely due to the fact that the concentration data for total coliforms were also somewhat zero-heavy, given that approximately 63% of the 568 total samples were negative for the presence of total coliforms. *Therefore, "contamination" from this point forward was considered as a binary response with "present" representing any concentration of total coliforms in the water samples other than zero.*

3.9.1 Statistical Analysis of Chemical Data

The first step in analyzing the chemical data was to observe overall trends in the relationships between the variables. This was done by creating a scatterplot matrix—a large figure that includes one small scatterplot for each pair of variables. Then, a model selection procedure was carried out to determine which predictors were appropriate to include in the logistic regression model.

There are three different types of selection procedures available. ***Forward selection*** is a method that introduces variables into the model one at a time. The process begins with the base model:

$$y_i = \beta_0 + \varepsilon_i \qquad \textbf{(Equation 3-1)}$$

where y_i is the predicted value, β_0 is the intercept and ε_i is the random error. Once a significance level (α) is chosen, variables are entered into the model one at a time, with the most significant variable being included first. When the step is reached where the inclusion of more variables does not increase the accuracy of the model, this is defined as the final model. For example, if the only two significant variables to enter the model were x_1 and x_2, the final model would be as follows:

$$\mathbf{y_i = \beta_0 + \beta_1(x_1) + \beta_2(x_2) + \varepsilon_i} \qquad \textbf{(Equation 3-2)}$$

While the ***backward selection*** procedure uses a similar step-by-step process, the initial model includes *all* the possible predictors, and variables are systematically removed based on their significance. Using the significance level (α), variables with the least significance are removed from the model first. The final model is defined by that in which all variables are significant. This model is generally recommended for exploratory applications, where relationships between and predictors and the response are unknown. Another inherent advantage of this technique is that in the full model with all predictive factors included, no potential relationship is overlooked. In the other procedures, it is likely that the full model will never be considered.

The ***stepwise selection*** process is a more intensive approach than the forward or backward elimination process. In stepwise selection, the initial model is the base model as shown in Equation 3-1. In step 1, the most significant predictor is *added* to the model, based on the significance level for entry (α_{in}). In step 2, if any of the variables in the model are no longer significant based on a level for exit (α_{out}), the least significant variable is *dropped*. Using this back and forth method ensures that variables that were entered into the model are still significant following the entry of other variables. The model is considered final when all variables in the model are significant and all variables not in the model are insignificant.

In the present study, there was a vast array of independent predictors including all results from the chemical analyses. Because the dependency between the predictors and the response was not clear, the backwards selection procedure was applied as an exploratory technique. The significance level for exit of a variable from the model during the selection procedure was chosen as $\alpha_{out}=0.05$. Although the backwards selection procedure was ultimately used to report the statistical results, the forwards and stepwise selection procedures were applied as well. In this case, all procedures resulted in the same regression model.

3.9.2 Statistical Analysis of Survey Data

The backwards selection procedure was once again used to determine whether any of the survey data was useful in predicting total coliform contamination. Because the backwards selection technique yielded an appropriate regression model, a logistic regression was carried out. A logistic regression is appropriate in the case of a binary dependent variable because the response has a non-normal error term and a non-constant error variance given that it is in the form of a probability. The mean response (π) is therefore constrained by $0 < \pi < 1$. A linear regression would not be appropriate because the mean response is free to escape these bounds. The bounds of the logistic function create a sigmoid response curve, as demonstrated in Figure 3-8. Predictor values (x) can range from $-\infty < x < +\infty$, but horizontal asymptotes constrain the response to appropriate values of π.

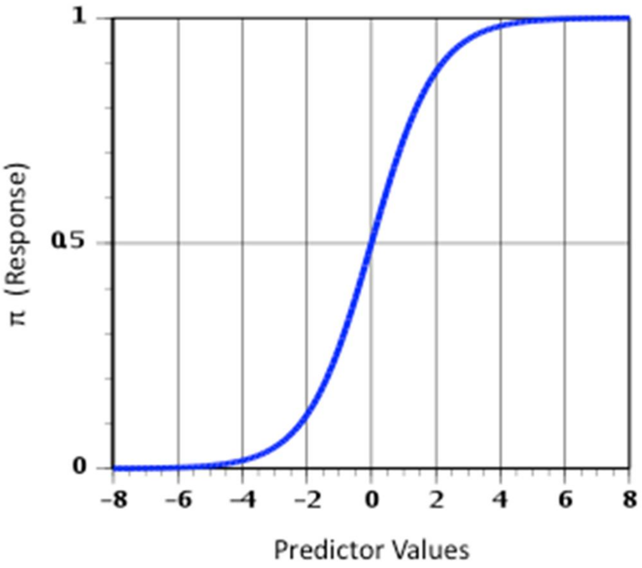

Figure 3-8. Sigmoid response function for a logistic regression predicting values of π, the response in the form of a probability bounded by 0 and 1.

The mathematical function describing the sigmoid curve is shown in Equation 3-3 below:

$$\pi = \frac{e^x}{1+e^x} \qquad \textbf{(Equation 3-3)}$$

where π is the mean response and x represents the value of a given predictor. In the case of multiple predictors, the regression equation is substituted for x, giving the following equation (Montgomery *et al.*, 2006):

$$\pi = \frac{e^{\beta_0 + \beta_1 x_1 \ldots + \varepsilon}}{1 + e^{\beta_0 + \beta_1 x_1 \ldots + \varepsilon}}$$ **(Equation 3-4)**

where β_0 is the intercept, β_1 is the estimate for the coefficient of the predictor x_1, and ε is the error term. The issue in this equation is that the predictors do not have a direct relationship with the response, which they must have in order to utilize standard regression tools.

A logistic regression is a model that falls under the category of “general linear models” (GLMs), which are linear models that utilize “link functions” to generalize to cases that do not have a linear response. The link function, in the case of a logistic regression, is the Logit function. A Logit function is constructed by starting with a probability (π) and taking the natural log of that probability’s “odds.” If the right side of Equation 3-4 is substituted for π in the Logit function, the result shows that the Logit function is equivalent to the regression equation itself. This procedure is shown below (Montgomery *et al.*, 2006):

$$\pi' = \ln\left\lfloor \frac{\pi}{1-\pi} \right\rfloor = \beta_0 + \beta_1 x_1 + \varepsilon$$ **(Equation 3-5)**

So, the logistic regression is, in reality, predicting the Logit function (π’), which is in turn being converted back to the predicted mean response (π). In this way, the Logit function is “linking” the regression equation and the predicted response.

In the JMP 9 software, the logistic regression was performed by using the “Fit Model” function. This automatically carried out a regression analysis once the appropriate options were specified. The dependent variable was selected, followed by the predictors. The personality (model type) was chosen as “Nominal Logistic” and then the model was run. The results provided the whole model test, lack of fit, parameter estimates, and effect likelihood ratio tests as default outputs. Using the logistic regression model, a response value below 0.5 was considered to be a prediction of an uncontaminated well. Conversely, a response value above 0.5 was considered to be a prediction of a contaminated well. The model predictions were compared to the observed data and used to determine the model accuracy.

As in a linear regression, there are tests used to determine the goodness of fit. The “Rsquare (U)” value in a logistic regression is analogous to the “R^2” value used in a linear regression. The Rsquare (U) value is often low in logistic regressions, which means that a significant portion of the variability in the data is unexplained by the model. This is because the logistic regression is using a continuous variability to predict a dichotomous outcome. Despite low Rsquare (U) values in general, higher values can still be taken to indicate a better fit if multiple models are being compared using the same dataset.

In order to analyze graphs such as that shown in Figure 3-8, the “Fit Y by X” function was used. This allowed for individual predictors to be examined for their effect on the response. Because the response was binary, JMP automatically performed a logistic fit with a sigmoid response for the continuous predictors. For the binary predictors, a likelihood ratio was provided by JMP. This number represents the likelihood that a water sample will be contaminated if the predictor takes on one value versus another.

4. RESULTS

4.1 Bacterial Enumeration

A total of 538 samples from 20 different VA counties [Figure 3-1] were analyzed for this study. Overall, 41% (n=221) of samples were positive for total coliforms and 10% (n=53) of samples were positive for *E. coli*. While high, this level of prevalence is consistent with previous assessments of well water quality in Table 1-1, which compiled rates of coliform positive samples in peer-reviewed private water quality studies from around the United States. Statistics for total coliforms and *E. coli* by county are shown in Table 4-1.

The counties with the highest percentage of samples positive for total coliforms were Fauquier (100%; note: single sample), Buckingham (72%, n=13), Lee (70%, n=7) and Tazewell (70%, n=7). However, these counties did not represent a significant portion (only 7%, n=39) of the total number of samples. The three counties with the greatest number of samples—Spotsylvania (n=130), Fredericksburg (n=126) and Loudoun (n=59), had percentages of samples positive for total coliforms between 30% and 45%. This percentage range includes the overall average of 39%, which is expected due to the large influence that these counties had on the total number of samples. Every county had at least one sample negative for total coliforms (excluding Fauquier, which only contributed a single sample). While numbers of total samples positive for *E. coli* were generally low, Smyth county had a high percentage of samples positive for *E. coli* (41%, n=9).

Distribution plots for the MPN of organisms resulting from total coliforms and *E. coli* enumeration are shown in Figure 4-1 and Figure 4-2, respectively. Both plots represent the probability that any given sample had a concentration of total coliforms or *E. coli* below the corresponding value on the y-axis. For example, consider a sample that had a total coliform concentration of 1000 MPN/100 mL. If a point on the curve was chosen that crossed the y-axis at 1000 MPN/100 mL, and this point was traced down to the x-axis, it would intersect at 97. This means 97% of samples had concentrations of total coliforms that were less than this sample (1000 MPN/100 mL).

The red dotted lines in Figures 4-1 and 4-2 represent the maximum detection limit of 5136 MPN/100 mL. Approximately 50% of samples had total coliform concentrations less than 40 MPN/100mL and *E. coli* concentrations less than 30 MPN/100mL. Figures 4-3 and 4-4 show the distribution plots for concentrations less than 1000 MPN/100 mL (total coliforms) and 500 MPN/100 mL (*E.* coli) in order to more clearly observe the percentage of samples that were greater than 0 MPN/100 mL. Note that 181 samples from the larger dataset were not included in these plots because they were only analyzed for presence/absence (Figure 3-2).

Table 4-1. Results of total coliforms and *E. coli* enumeration from the VAHWQP clinics conducted in 2011, by county.

	Total Coliforms				***E. coli***			
Clinic	**% Pos**	**Min**	**Mean**	**Max**	**% Pos**	**Min**	**Mean**	**Max**
Buckingham (n=18)	72	0	104.6	746	1	0	0.4	6
Caroline (n=5)	60	-	-	-	20	-	-	-
Clarke (n=17)	12	0	0.6	6	0	0	0.0	0
Fauquier (n=1)	100	-	-	-	0	-	-	-
Frederick (n=34)	21	0	16.5	447	3	0	0.0	1
Fredericksburg (quantified) (n=66)	42	0	234.9	> 5136	12	0	81.7	> 5136
Fredericksburg (unquantified) (n=60)	50	-	-	-	5	-	-	-
Isle of Wight (n=16)	25	0	325.5	> 5136	6	0	10.0	160
King George (quantified) (n=2)	0	0	0.0	0	0	0	0.0	0
King George (unquantified) (n=2)	50	-	-	-	0	-	-	-
Lee (n=10)	70	0	7.0	27	30	0	0.5	2
Loudoun (n=59)	37	0	100.0	> 5136	10	0	14.2	793
Louisa (quantified) (n=5)	20	0	1.2	6	0	0	0.0	0
Louisa (unquantified) (n=18)	17	-	-	-	0	-	-	-
Lunenburg (n=7)	29	0	4.1	27	0	0	0.0	0
Orange (n=2)	0	0	0.0	0	0	0	0.0	0
Russell (n=5)	60	0	2.1	6	0	0	0.0	0
Scott (n=9)	33	0	9.2	38	11	0	0.1	1
Smyth (n=22)	55	0	77.6	793	41	0	39.4	591
Spotsylvania (quantified) (n=53)	42	0	156.2	> 5136	11	0	16.6	703
Spotsylvania (unquantified) (n=77)	27	-	-	-	1	-	-	-
Stafford (quantified) (n=20)	60	0	379.7	> 5136	0	25	22.2	261
Stafford (unquantified) (n=19)	42	-	-	-	16	-	-	-
Tazewell (n=10)	70	0	199.0	1337	40	0	166.1	1216
Westmoreland (n=1)	0	0	0.0	0	0	0	0.0	0

Note: Min, Mean & Max values reported in MPN/100 mL, where 5136 MPN/100 mL was the detection limit

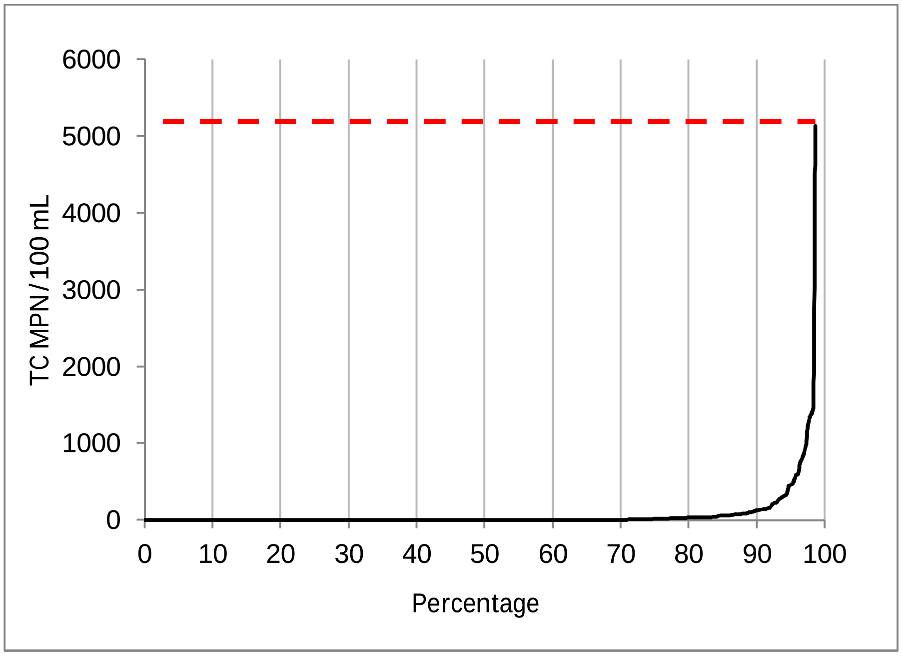

Figure 4-1. Cumulative distribution plot for total coliforms (n=357).

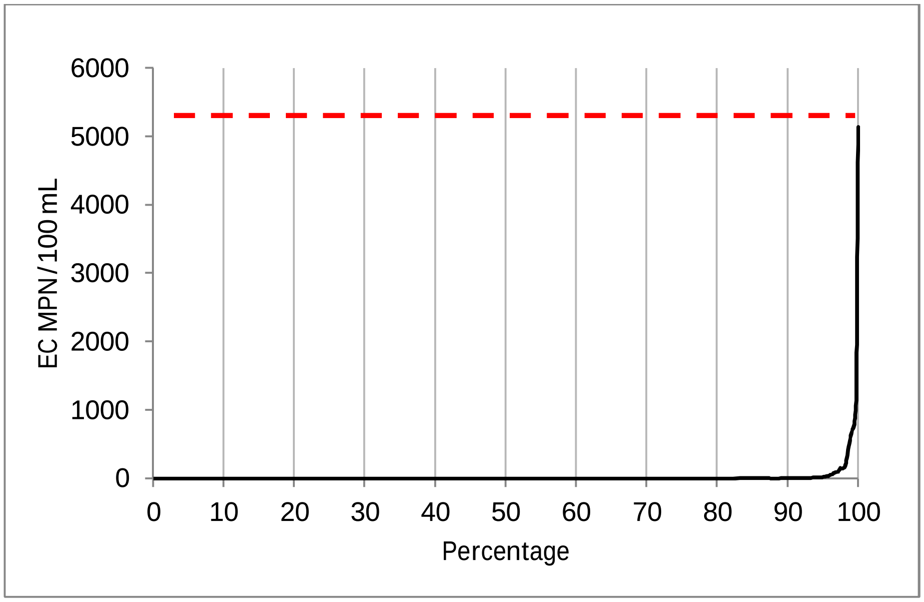

Figure 4-2. Cumulative distribution plot for *E. coli* (n=357).

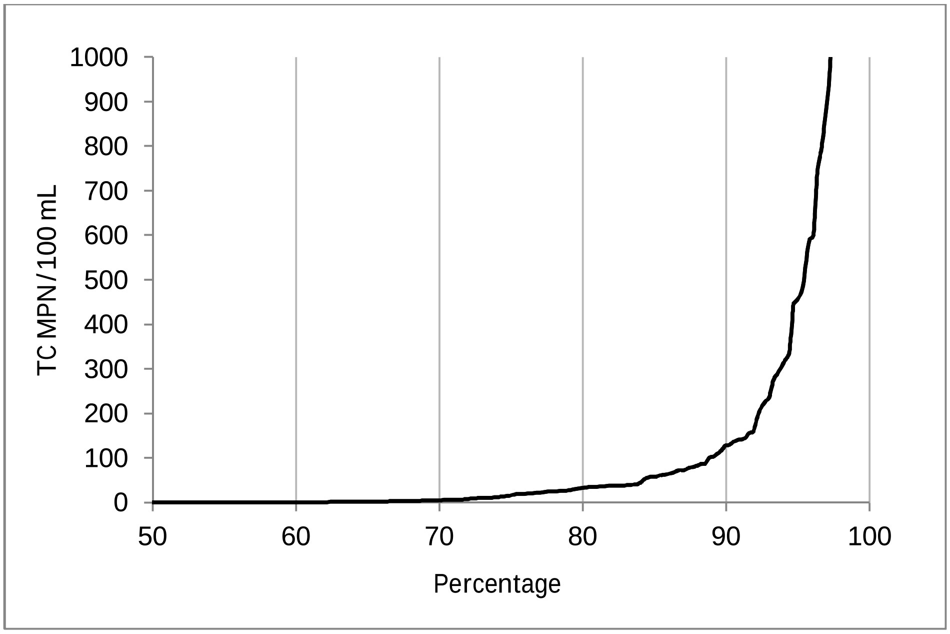

Figure 4-3. Close view of cumulative distribution plot for total coliforms (50<%<100; 0<MPN<1000).

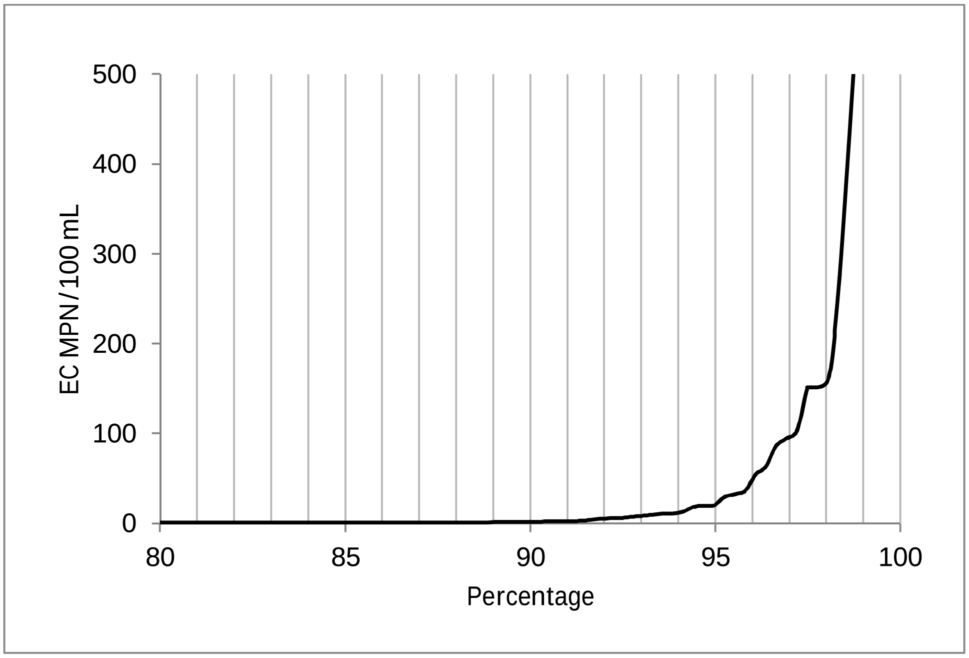

Figure 4-4. Close view of cumulative distribution plot for *E. coli* (80<%<100; 0<MPN<500).

Table 4-2 shows the rates of total coliform and *E. coli* contamination according to system type. Drilled wells had much lower contamination rates than cisterns, springs and dug/bored wells for both total coliforms and *E. coli*. Only one cistern was analyzed in this study, and it was positive for both total coliforms and *E. coli*.

Table 4-2. Rates of contamination by system type.

System Type	**Total Coliform (+ve)**	***E. coli* (+ve)**
Cistern (n=1)	n=1 (100%)	n=1 (100%)
Spring (n=13)	n=9 (69%)	n=4 (31%)
Dug/Bored Well (n=130)	n=98 (75%)	n=26 (20%)
Drilled Well (n=353)	n=99 (28%)	n=22 (6%)

Table 4-3 shows the characteristics of the *E. coli* positive samples. Note that the average total coliforms and *E. coli* concentrations were very high compared to the average values for the entire dataset, which were 137 MPN/100 mL for total coliforms and 29 MPN/100 mL for *E. coli*. The majority of systems contaminated with *E. coli* were dug or bored wells (49%), and none of the homeowners indicated that they used a water treatment device. Most *E. coli* contaminated systems were located in a rural community or on a farm and the average well depth for these systems was 112 ft, which is less than the average for the entire dataset (n=538), which was 246 ft. There is no evidence that any of the water properties (taste, odor, color, suspended particles) have the ability to indicate that drinking water is contaminated with *E. coli*.

Table 4-3. Characteristics of *E. coli* positive samples.

Variable		
Avg TC MPN/100 mL (of n=46 quantified samples)	879	
Avg EC MPN/100 mL (of n=46 quantified samples)	223	
System Type	Springs: n=4 (7.5%)	
	Cisterns: n=1 (2%)	
	Driled Wells: n=18 (34%)	
	Dug/Bored Wells: n=26 (49%)	
	No Response: n=4 (7.5%)	
Treatment Device	Yes: n=18 (34%)	Chlorinator: n=0 (0%)
		Other: n=18 (100%)
Average Well Depth (out of n=29 responses)	112 ft	
Average Year Built (out of n=27 responses)	1980	
Location	On a Farm: n=14 (26.5%)	
	On a Remote, Rural Lot: n=10 (19%)	
	In a Rural Community: n=24 (45%)	
	In a Housing Subdivision: n=4 (7.5%)	
	No Response: n=1 (2%)	
Corrosion of Piping	Yes: n=9 (17%)	
Unpleasant Taste	Yes: n=7 (13%)	
Objectionable Odor	Yes: n=4 (7.5%)	
Unnatural Color	Yes: n=12 (23%)	
Water Stains Applicances	Yes: n=20 (38%)	
Visible Particles in Water	Yes: n=7 (13%)	
System is Located Within 100 feet of…	Septic System Drain Field: n=6 (11%)	
	Pit, Privy or Outhouse: n=0 (0%)	
	Cemetery: n=2 (4%)	
	Home Heating Oil Storage Tank: n=2 (4%)	
	Pond or Freshwater Stream: n=2 (4%)	
	Compost Pile: n=0 (0%)	
System is Located Within 1/2 Mile of…	Landfill: n=2 (4%)	
	Illegal Dump: n=1 (2%)	
	Active Quarry: n=0 (0%)	
	Abandonded Quarry: n=1 (2%)	
	Commercial Underground Storage Tank: n=0 (0%)	
	Golf Course: n=1 (2%)	
	Fruit Orchard: n=12 (23%)	
	Farm Animal Operation: n=23 (43%)	

4.2 Chemical Source Tracking

Of the 372 samples tested for the presence of optical brighteners associated with anthropogenic contamination via fluorometry, there were 3 positive results [i.e. values were between 50-100 units]. After four hours' exposure to UV light, which serves to degrade human associated optical brighteners to distinguish between natural and anthropomorphic sources, the samples showed declines in their readings of approximately 30% or greater. Fluorometer readings as high as those seen in these VAHWQP samples are not appropriate for drinking water, as there are no known natural compounds that fluoresce at the same wavelengths as optical brighteners. High-performance liquid chromatography (HPLC) would be required in order to characterize specific compounds present in the water samples.

The samples that tested positive for optical brighteners came from older, dug/bored, relatively shallow wells that had high concentrations of coliform bacteria (Table 4-4). Well age and depth were not provided for sample DWC 501. This sample was also from the final VAHWQP cohort of samples where only presence/absence of total coliforms and *E. coli* was examined. Raw data output from the fluorometer can be found in Appendix B.

Table 4-4. Characteristics of samples that tested positive for the presence of optical brighteners.

County	Fluorometer Reading	TC/EC MPN per 100 mL	System Type	Well Age (year built)	Well Depth (feet)	Located within 100 ft	Perceived Water Quality Problems
Fredericksburg	90.00	>5136/>5136	Dug/Bored	1945	60	None	Metallic Taste, Yellow Color
Fredericksburg	56.80	>5136/2	Dug/Bored	1956	50	Septic Tank	Unspecified Color, Blue Stain
Stafford	63.80	+ve/+ve	Dug/Bored	N/A	N/A	None	Yellow Color
Note: 5136 MPN/100 mL was the detection limit							

4.3 Microbial Source Tracking

In order to further investigate possible sources of contamination, PCR targeting *Bacteroides* genes was performed on 26 *E. coli* positive samples (Figure 3-2). One sample was positive for general *Bacteroides* (Bac32F). No samples were positive for the human specific (HF183). A DNA ladder and known positives were run in the agarose gel along with the PCR products. Figure 4-5 shows the gel that was run with the products of PCR for general *Bacteroides* (Bac32F). Half of the samples (n=13) were run on this particular gel. Well 2 (from the left) contained the ladder, well 3 contained the known positive, and well 10 contained the positive sample. Figures 4-6, 4-7 and 4-8 show the other 3 gels, all of which were negative. The gel containing the first 13 samples for HF183 (Figure 4-7) was not run with a control.

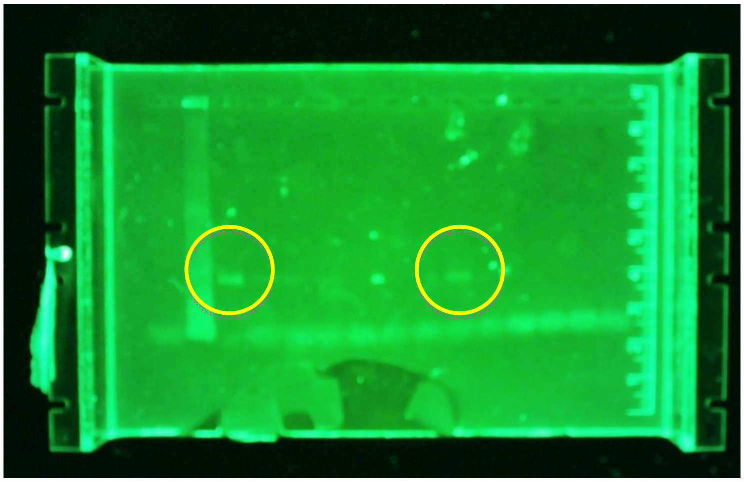

Figure 4-5. Results of gel electrophoresis (first 13 samples) for general *Bacteroides* (Bac32F).

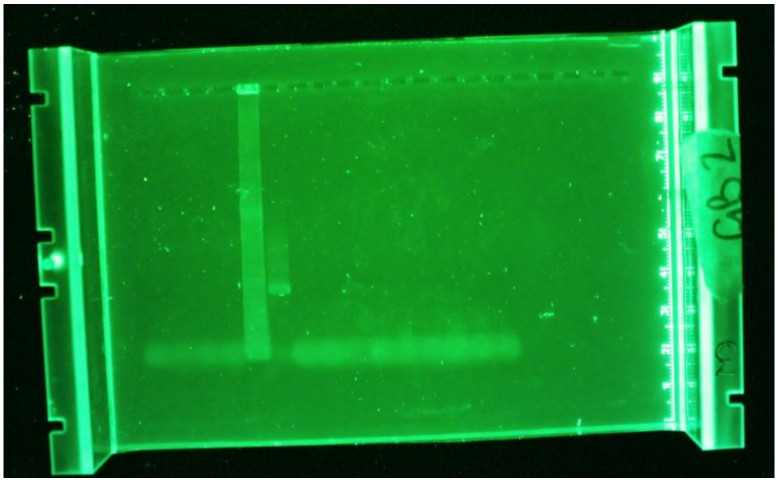

Figure 4-6. Results of gel electrophoresis (second 13 samples) for general *Bacteroides* (Bac32F).

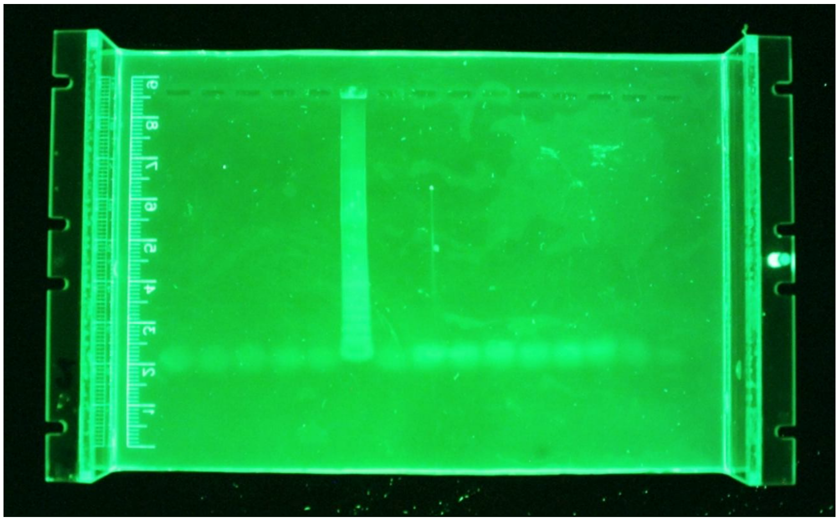

Figure 4-7. Results of gel electrophoresis (first 13 samples) for human specific *Bacteroides* (HF183).

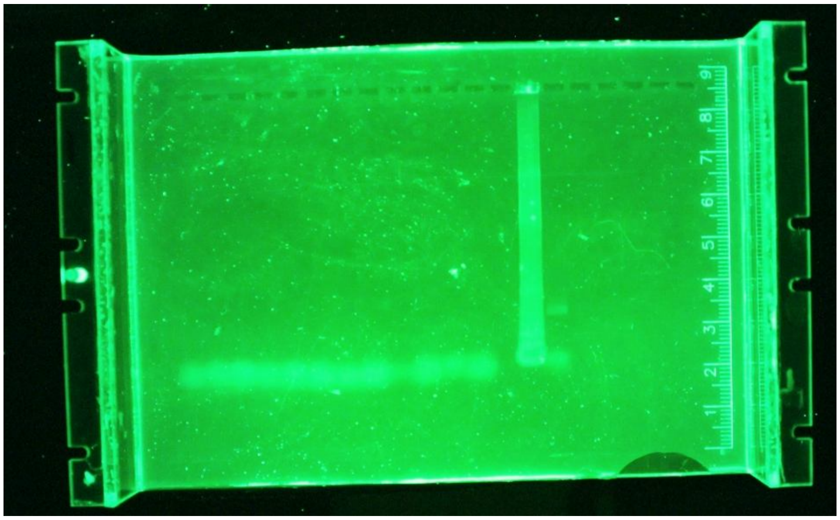

Figure 4-8. Results of gel electrophoresis (first 13 samples) for human specific *Bacteroides* (HF183).

4.4 Statistical Analysis

4.4.1 Statistical Analysis of Chemical Data

A series of statistical techniques were employed to investigate possible correlations between the chemical data (e.g. nitrate, conductivity) and microbial contamination. As discussed earlier, microbial contamination in this study is considered to be any sample positive for total coliforms. Again, *E. coli* was not considered in the statistical analysis because there were not enough positive samples to gain statistical significance. An initial scatterplot matrix comparing microbial contamination and chemical parameters is provided in Figure 4-9. Strong correlations are labeled in red, while weak correlations are labeled in pink. Note that sulfate and sulfur have a perfect correlation because they are mathematically dependent. Similarly, TC and TC2 have a perfect correlation because TC2 represents the TC dataset with values truncated at 500 MPN/100 mL in order to elongate the y-axis for better visualization of trends. Calcium and magnesium are strongly associated with hardness, which is expected since hardness is determined in the VAHWQP samples by the concentrations of Ca^{2+} and Mg^{2+} ions. While some other weak correlations are present, the scatterplot yields no indication that any of the chemical data is useful in predicting the presence of total coliforms.

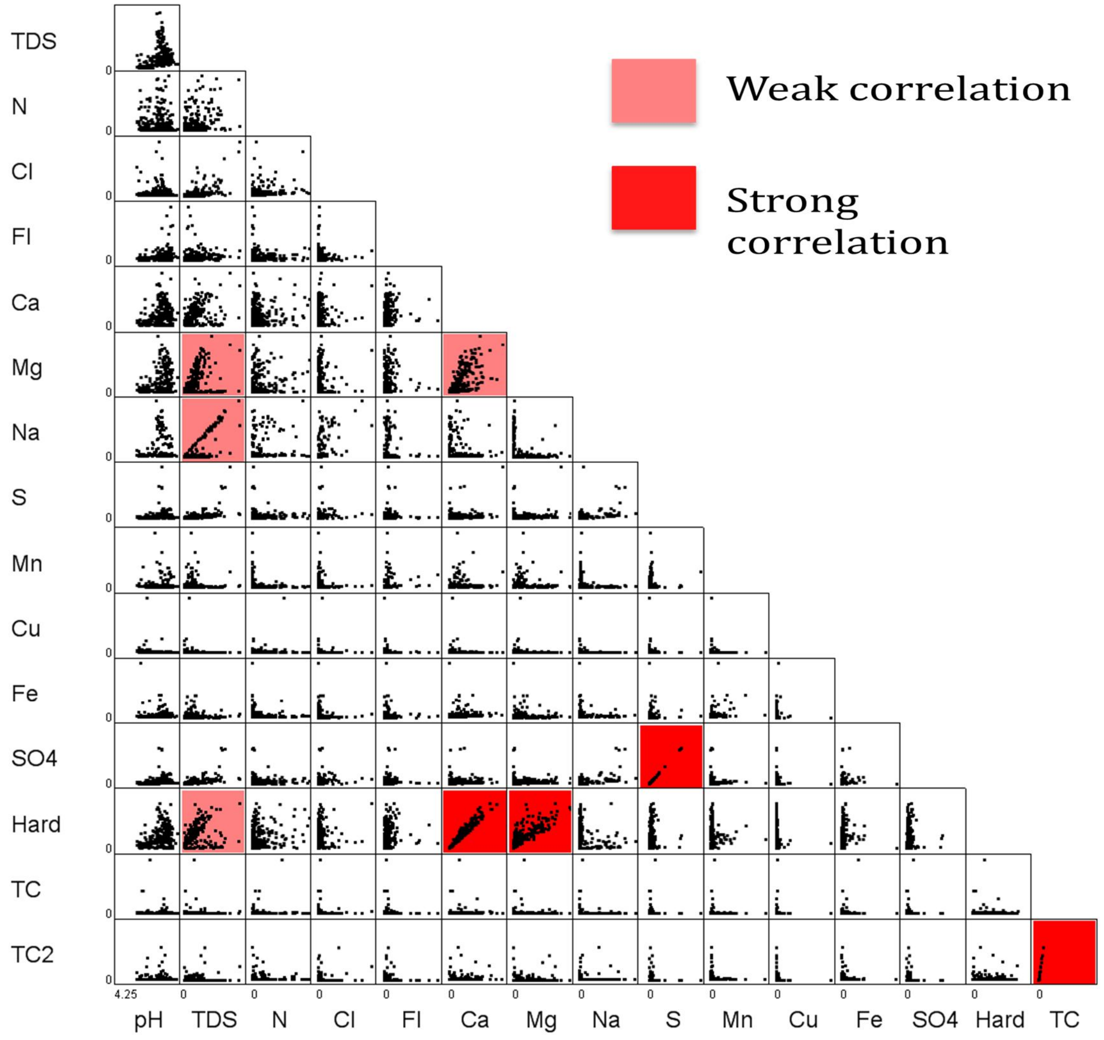

Figure 4-9. Scatterplot matrix showing trends between chemical data and total coliforms contamination.

While results from this initial effort did not provide evidence of predictive capabilities, a model selection procedure was used to further investigate possible links between chemical data and total coliform positive samples. Table 4-5 provides a summary of the results from the backwards selection procedure (as discussed in Section 3.9.1) used to explore this dataset. All variables were initially entered into the model, and variables were removed one at a time based on a significance threshold of α=0.05. At the conclusion of the selection procedure, no variables remained in the model. These results support the results of the scatterplot matrix, in that none of the variables show evidence of being predictive of total coliform contamination.

Table 4-5. Summary of the backwards selection procedure used to determine significant predictors of total coliform contamination from chemical data.

Parameter	Action	"Sig Prob"
All	Entered	.
TDS	Removed	0.9527
Iron	Removed	0.7810
Manganese	Removed	0.8152
Chloride	Removed	0.7733
Sulfur	Removed	0.8031
Fluoride	Removed	0.7770
Copper	Removed	0.6896
pH	Removed	0.6722
Calcium	Removed	0.4998
Nitrate-N	Removed	0.4633
Sodium	Removed	0.2318
Magnesium	Removed	0.0761
Hardness	Removed	0.5541

4.4.2 Statistical Analysis of Survey Data

The statistical analysis of the dependency of total coliform contamination on survey data began with an initial screening of data availability, as VAHWQP participants sometimes chose not to answer all of the survey questions. Any survey questions that had response rates of less than 5% (27 respondents) were excluded from the analysis. The following questions were therefore not used in the statistical analysis of survey data:

1. Is your water source located within 100 ft of a (i) pit/privy or outhouse, (ii) cemetery?
2. Is your water source located within ½ mile of a (i) landfill, (ii) illegal dump, (iii) active quarry, (iv) abandoned quarry, (v) commercial UST, (vi) golf course, (vii) manufacturing plant?
3. Is your household water distribution system primarily composed of (i) steel piping, (ii) lead piping?

Once these variables were removed, a backwards selection procedure using the remaining variables was performed to determine significant predictive factors. The p-value threshold for variable exit was set at $\alpha=0.05$. All the variables that remained in the model had p-values less than 0.02 (Table 4.6). All variables that were removed from the model had p-values greater than 0.13. The selection procedure determined that variables that had a significant association with total coliform contamination were (i) water supply system type ([dug/bored well] versus [drilled well *or* no response]), (ii) whether or not the homeowner had any type of water treatment device, (iii) well depth, and (iv) whether or not the water supply system was located within ½ mile of a farm animal operation. Note that, at this point in the statistical procedure, springs were no longer considered as part of the analysis because there was not data for "depth" from these types of systems, and the model was only able to make predictions for samples that had data for all the predictive variables that were included in the regression equation.

Using the nominal logistic regression procedure, an initial model was developed that could be used to predict whether a well would be contaminated with total coliforms based on these four predictive factors. The parameter estimates from this model (Table 4-7) revealed that well type (i.e. drilled vs. dug/bored) was no longer considered to be significant based on $\alpha=0.05$. Therefore, a second model was created using (i) treatment device [yes/no], (ii) well depth, and (iii) farm animal operation within ½ mile of a well [yes/no] as the three predictive factors (Table 4-8). Comparing p-values from Tables 4-7 and 4-8, the removal of system type as a variable in the regression model caused an increase in the significance of the treatment device variable and the intercept. In the case of the intercept, the removal of system type caused its estimate to become significant, with $p<0.05$. The significance of well depth stayed the same, with $p<0.0001$, and the variable representing a system being located within ½ mile of a farm animal operation dropped slightly in significance from $p=0.0205$ to $p=0.0343$.

Table 4-6. Summary of the selection procedure used to determine significant predictors total coliform contamination from survey data.

Parameter	**Action**	**p-value**
All	Entered	.
Heating Oil Storage Tank within 100 ft [yes/no]	Removed	0.8346
Septic Tank within 100 ft [yes/no]	Removed	0.7522
Objectionable Odor [yes/no]	Removed	0.7396
Corrosion of Pipes [yes/no]	Removed	0.5961
Water Stains Appliances [yes/no]	Removed	0.5749
Fruit Orchard within ½ mile [yes/no]	Removed	0.548
Copper Piping [yes/no]	Removed	0.3459
Community Type (Location)	Removed	0.2648
Particles in Water [yes/no]	Removed	0.2457
Year System was Built	Removed	0.1807
Stream/Pond/Lake within 100 ft [yes/no]	Removed	0.1622
Plastic Piping [yes/no]	Removed	0.1577
Unusual Water Color [yes/no]	Removed	0.1486
Objectionable Water Taste [yes/no]	Removed	0.1316
System Type ([Dug/Bored Well] vs [No Response & Drilled Well])	*Included*	*0.0035*
Treatment Device [yes/no]	*Included*	*0.0193*
Well Depth [feet]	*Included*	*4.33E-05*
Farm Animal Operation within ½ mile [yes/no]	*Included*	*0.0065*

Note: 8% (n=41) of homeowners did not respond to the question regarding system type.

Table 4-7. Parameter estimates from the initial model predicting total coliform contamination.

Term	**Estimate**	**Prob>ChiSq**
Intercept	0.7047	0.0839
Type [Drilled Well]	-0.4837	0.1889
Type [Dug/Bored Well]	0.6210	0.1327
Treatment [yes]	-0.3693	0.0056
Depth [feet]	-0.0042	<0.0001
Farm Animal Operation [yes]	0.3164	0.0205

Table 4-8. Parameter estimates for the refined regression model predicting total coliform contamination.

Term	Estimate	Prob>ChiSq
Intercept	0.9108	<0.0001
Farm Animal Operation [yes]	0.2807	0.0343
Treatment [yes]	-0.4739	0.0002
Depth [feet]	-0.0060	<0.0001

The resulting logistic regression model is shown in Equation 4-1 below:

$$\pi = \frac{e^{0.9108+0.2807*(Farm)-0.4739*(Treatment)-0.006*(Depth)+\varepsilon}}{1+e^{0.9108+0.2807*(Farm)-0.4739*(Treatment)-0.006*(Depth)+\varepsilon}} \quad \textbf{(Equation 4-1)}$$

Using Equation 4-1, the model's predictions of the presence/absence of total coliform contamination were compared to observed presence/absence of total coliform contamination to determine the accuracy of the model. Results show that the model predicted the presence/absence of total coliform contamination with 74% accuracy. Figure 4-10 shows a contingency table that breaks down the model accuracy into further detail. This table was constructed in JMP 9 by saving the probability formula of the logistic regression model, launching a "Fit Y by X" analysis under the "Analyze" tab, and comparing the dataset with observed presence/absence of TC versus the dataset with values representing the model's prediction (a column automatically created by the program when the probability formula is saved).

		Observed	
		+ve	-ve
Predicted	+ve	56 16.52 42.42 24.14	176 51.92 ***85.02*** 75.86
	-ve	76 22.42 ***57.58*** 71.03	31 9.14 14.98 28.97

Count
Total %
Column %
Row %

Figure 4-10. Contingency table breaking down the accuracy of the regression model.

On the outside of the boxes, a “+ve” represents a positive and a “-ve” represents a negative. For example, the box in the top right corner represents samples that *were negative* for total coliforms, and were also *predicted to be negative* by the model—“-ve” and “-ve”. The four numbers in each box, from top to bottom, represent (i) the total number of samples that fell into that category (Count), (ii) the percentage of total samples that fell into that category (Total %), (iii) the percentage of that column’s samples that fell into that category (Column %), and (iv) the percentage of that row’s samples that fell into that category (Row %). In the top right box, the column percentage (in green) shows that 85% of samples that were negative were also predicted by the model to be negative (i.e. 15% false positives). In the bottom left box, the column percentage (in green) shows that 58% of samples that were positive were correctly predicted by the model to be positive (i.e. 42% false negatives). Because of the possible health related implications of predicting false negatives (predicting that a well is not contaminated when, in fact, it is contaminated), the goal should be to minimize this rate in the future.

Some of the variables in this analysis were close to being within the threshold of α=0.05 with n=538 samples. If more data is available in the future, some of these variables may become significant and be included in the model. The possibility of including more variables in the model will allow for a greater variety of models to be explored, resulting in optimization of model performance.

5. SUMMARY & CONCLUSIONS

5.1 Prevalence of Well Contamination

One of the major goals of this study was to determine if incidence rates of total coliform contamination of private water supplies that were tested as part of the VAHWQP were similar to rates reported in recent peer reviewed literature. The results of this study were consistent with those of previous peer reviewed literature (Table 1-1), given that 41% of samples were positive for total coliforms and 10% of the samples were positive for *E. coli* (n=538, 20 counties). While not generally pathogenic, the presence of total coliforms and/or *E. coli* in private drinking water samples does suggest possible sources of contamination such as breaches in well construction or poorly maintained water filters, as well as the possibility of exposure to actual human pathogens. As current EPA drinking water standards for municipal waters simply require confirmation of coliform absence, no previous study on private drinking water reported in the literature has attempted to quantify bacterial contamination. Concentrations of total coliforms and *E. coli* observed in this study were high, with 53 samples above the EPA's municipal drinking water standards for *E. coli*, which require a zero maximum contaminant level. Six samples were above the maximum detection limit of 5136 MPN/100 mL for total coliforms, and one samples was above the maximum detection limit of 5136 MPN/100 mL for *E. coli*.

5.2 Chemical Source Tracking

Because significant levels of bacterial contamination occurred in the samples received from the first several clinics in 2011, fluorometry was added to the protocol for sample analysis as a method of tracking whether or not contamination may be coming from a nearby septic tank (e.g. source of human waste). Therefore, 372 of the total 538 samples were tested for the presence of optical brighteners (Figure 3-2). If optical brighteners were present in a water sample, this was taken as an indication of possible contamination from a septic tank because these chemicals are present in toilet paper and/or laundry detergent. Of the 372 samples analyzed, 3 tested positive for optical brighteners. Common characteristics of these 3 samples were that they were all collected from shallow dug or bored wells with perceived discoloration of water. Data collected for two of the three wells revealed that wells were constructed in 1945 and 1956. The age of the third well was not provided. All three samples from these wells were positive for both *E. coli* and total coliforms.

5.3 Microbial Source Tracking

In an additional effort to determine whether bacterial contamination was coming from humans or animals, microbial source tracking was performed using end-point PCR targeting specific sequences within the 16S rRNA gene of *Bacteroides*. Twenty-six EC positive samples were analyzed for the sequence *Bacteroides* HF183 as a human-specific marker, and Bac32F as a general *Bacteroides* marker. One sample was positive for general *Bacteroides*, with no samples positive for human-specific *Bacteroides*. The sample that was positive for general *Bacteroides* was not analyzed on the fluorometer because it was taken from one of the initial clinics before fluorometry analysis was initiated. It was, however, sourced from a spring, on a farm, and had a total coliform concentration of 128 MPN/100 mL and an *E. coli* concentration of 95 MPN/100 mL. This was consistent with PCR results and therefore promising for future source tracking efforts.

It should be noted that there was no internal control during PCR, which means that there is no way to determine whether any inhibition occurred. However, the DNA isolation protocol included exposure to InhibitEX (Inhibitex, Inc., Alpharetta, GA) tablets to which inhibitors were adsorbed for removal by pelleting. It is also important to consider that negative source tracking results do not necessarily discount the possibility of fecal contamination from humans or animals, given that *Bacteroides* die off more rapidly than *E. coli* in the environment (Allsop and Stickler, 1985; Fiksdal *et al.*, 1985). Additional complications arise in characterizing human specific *Bacteroides* because the human specific marker (HF183) is not present in 100% of the human population. False negatives for the presence of human fecal contamination could result if nobody living near a particular private drinking water supply system is carrying the HF183 marker.

One of the most effective techniques for microbial source tracking that is currently used is PCR targeting the Bac32F marker for indication of general *Bacteroides* and the HF183 marker for the indication of human specific *Bacteroides*. However, this method may not be effective for assessing water quality in private drinking water supply systems because a large volume of water is necessary to capture enough bacteria to observe detectable levels of DNA. An effective strategy for source tracking in private drinking water supply has yet to be formulated. It would be convenient to target *E. coli* as a possible candidate for source distinction because *E. coli* was present in 10% of the VAHWQP samples analyzed in this study, whereas the percentage of samples with *Bacteroides* present was unknown and could be much lower. The *E. coli* enterotoxin gene (STIb) has been associated with human fecal contamination with assays that have been previously developed (Field *et al.*, 2003).

5.4 Statistical Analysis

As discussed in Section 1.2, previous studies have not been consistent in their ability to correlate bacterial contamination of private drinking water supplies with predictive factors. Predictive factors considered in this study were the presence of particular chemicals in the water samples, and data collected via the VAHWQP drinking water clinic participant survey that provided system characteristics, the owner’s perception of the water quality, and perceived local environmental factors that posed a potential contamination risk.

Results from logistic regression analysis revealed that none of the chemical tests were useful in predicting total coliform contamination in the water samples. No previous studies have shown significant associations between bacterial contamination and concentrations of particular chemicals in private drinking water systems. However, these relationships should continue to be explored, with expectations that there may be possible correlations between bacterial contamination and chemicals that might indicate surface water infiltration, such as nitrates, which are used in fertilizers and are generally found in runoff.

The survey data showed more promise in its ability to predict total coliform contamination. A logistic regression was performed on the survey data, and the final regression model included three significant (α=0.05) predictors of total coliform contamination—well depth, whether the owner had any type of water treatment device, and whether the well was located within ½ mile of a farm animal operation. The final regression model was able to predict the presence/absence of total coliform contamination in wells with 74% accuracy. However, 17% of the total predictions were false negatives. In this case, while the main goal of the model is to predict total coliform contamination as accurately as possible, minimizing false negatives is important due to the health related implications of giving the false impression that a private water supply system is uncontaminated.

It is important to note that, although the statistical analysis considered the presence or absence of a water treatment device, there was not a large enough sample size to consider “type of device”. Not all treatment devices indicated in the VAHWQP survey were devices that necessarily targeted bacteria, as opposed to other constituents such as chemicals or sediments. However, the presence of a water treatment device of any type shows evidence that the private water supply system owner is conscious of their water quality. This may indirectly correlate with lower levels of bacterial contamination due to more frequent water quality testing or other proactive measures potentially taken by the private water supply system owner. While the presence of a water treatment device can increase the quality of water that comes from a private water supply, neglected water treatment devices can become a *source* of bacterial contamination themselves. Another complicating factor is that the most probable number of bacteria per 100 mL of water is already a statistically determined number. Creating a model to predict a concentration value that is already statistically dependent increases the uncertainty of the results.

5.5 Suggestions for future research

In general, there are two types of studies that investigate drinking water quality in private systems—those that are organized as formal epidemiological studies and those that are associated with extension and/or outreach efforts. These two types of studies offer their respective advantages. For example, epidemiological studies are randomized such that a minimization of bias is ensured. Therefore, causative factors can be identified with high confidence and risk can be explicitly quantified. Conversely, studies that are associated with extension and/or outreach programs offer the advantage of providing education to the people who are affected by the results of the study. For example, the VAHWQP provides water quality testing results to private water supply system owners and holds an interpretation meeting where participants learn about the significance of their results and possible remediation strategies.

In order to analyze predictive relationships between causative factors and bacterial contamination, it would be very useful to design a study where participants are randomized within certain predetermined groups. For example, if it initially appears that private water supply systems located near farms are generally more contaminated than others, a large set of samples should be taken from either location and then a statistical comparison made. More analyses of this type will be crucial in uncovering causative factors and their ability to predict contamination on either a quantitative basis, or at the least with relative "levels". From an epidemiological standpoint, a cohort study could be designed to investigate questions like—"Do people who drink from contaminated water supplies see a higher rate of any particular illnesses or health problems than people who drink from uncontaminated water supplies?" Or, more specifically—"Do people who drink from water supplies that are contaminated by a *human source* see a higher rate of illness than those who are drinking from water supplies contaminated by a *non-human source*?" Because these types of drinking water studies serve at least partially to highlight private drinking water contamination as an increasingly recognized public health issue, including the health impacts of drinking contaminated water would bring the investigation full circle.

Although epidemiological studies could be very useful in this regard, extension and outreach programs such as the VAHWQP still offer a consistent opportunity to provide evidence of the significance of this public health concern. Extension programs, over time, gather an immense amount of participant-provided data on private water supply contamination along with a multitude of potentially related factors, while also empowering private water supply system owners to become active stewards of their health and the health of the local environment. Through education, this approach bridges the gap between scientific investigation and implementation of preventative and remediation strategies to produce tangible improvements in public health.

With the continuation of source tracking efforts in the VAHWQP program, both chemically and microbially, it would be possible to determine whether observed health effects of consuming contaminated water are different or more prevalent based on human vs. animal contamination sources. This is an additional benefit of source tracking, aside from private water supply system owners being more informed regarding the source of contamination and subsequently being able to benefit from more efficient remediation strategies. Fluorometry should be considered in all future private drinking water studies, as it is a simple procedure that can easily identify the potential for human fecal contamination sources. PCR should continue to be utilized as well, but run with internal controls in order to properly ensure that inhibition is not obscuring the results. Because PCR is an intensive process, performing this analysis on *E. coli* positive samples is a good way to limit the number of samples that need to be examined.

Previous studies related to bacterial contamination of private drinking water were generally restricted to prevalence of contamination and did not primarily address (i) quantification of *E. coli* and total coliforms in drinking water samples, (ii) statistical and predictive relationships between bacterial contamination and a vast array of chemical and environmental factors, or (iii) sources of contamination. These issues were addressed in this study and should continue to be addressed in future studies. If predictive relationships between bacterial contamination and causative factors are successfully identified, private water supply system owners that are subject to these factors can be cautioned and urged to test their water more frequently. Also, homeowners who are looking to construct new drinking water systems can consider these factors in order to prevent future contamination issues.

Statistical analyses of the type that were performed in this study would be particularly useful on *larger datasets*. With a larger dataset, statistical significance would be much stronger and the large percentage of negative results would not leave a sample size too small for proper analysis of *E. coli* positive samples. It is likely that in order to successfully use regression tools on *E. coli* data, the number of *E. coli* positive samples should be closer to n=100. This is about twice as many *E. coli* positive samples as were observed in this study (n=53). Assuming the percent of *E. coli* positive samples (10%) is relatively consistent in private drinking water samples, an overall sample size of approximately n=1000 would be required to achieve n=100 *E. coli* positive samples.

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APPENDIX A. VAHWQP PARTICIPANT QUESTIONNAIRE

Biological Systems Engineering Department Water Quality Lab
400 Seitz Hall (0303) Blacksburg, VA 24061 540-231-9058 wellwater@vt.edu

SAMPLE IDENTIFICATION

Please print clearly and provide complete information on both sides of form.

Sample No.: ___DWC_______Date Collected: ____________

Sample submitted by:

Name: ____

Telephone: ____________________________________

Mailing Address: ________________________________
____

Sample Address: ____________________________
(if different from mailing)
____

FOR OFFICE USE ONLY

Lab Sample No.________________

<u>BEFORE</u> COLLECTING YOUR SAMPLES:

- **Complete the questionnaire below and take with your sample bottles to the drop-off location. This information is important for interpreting your test results.**
- **Read attached sampling instructions CAREFULLY.**
- **Water samples must be collected ONLY on the morning of the assigned date. Contact your extension office or the Water Quality Lab at 540-231-9058 if you have questions.**

WATER SOURCE:

1. What household water supply source was **drawn for sample? Check one:**
   ☐ well ☐ spring ☐ cistern ☐ other → specify: ____________________________

   If <u>well</u> is checked above: (a) is it: ☐ a dug or bored well ☐ a drilled well ☐ don't know;
   (b) what is the well's approximate depth, if known? __________ feet
   (c) what year was well constructed, if known? ________

   a. Where was this sample collected? ☐ pressure tank ☐ kitchen faucet ☐ bathroom faucet
   ☐ outdoor faucet/hose ☐ other __________

2. What water treatment devices are currently installed and affecting **cold water only** drawn at faucet for sample? Check **<u>all</u>** that apply:

   ☐ none
   ☐ water softener (conditioner)
   ☐ iron removal filter
   ☐ automatic chlorinator
   ☐ acid water neutralizer
   ☐ sediment filter (screen or sand type)
   ☐ activated carbon (charcoal) filter
   ☐ other → specify: __________________________

3. Describe the location of your home. Check **<u>one</u>**:
   ☐ on a farm ☐ on a remote, rural lot ☐ in a rural community ☐ in a housing subdivision

4. What pipe material is primarily used throughout your house for water distribution?

☐ copper ☐ lead ☐ galvanized steel ☐ plastic (PVC, PE, etc.) ☐ don't know
☐ other → specify: ____________

5. Do you have problems with corrosion or pitting of pipes or plumbing fixtures? ☐ yes ☐ no

WATER CHARACTERISTICS: **Please answer the following questions as completely as possible, based on how you view the present condition of the water sampled, including improvements due to any treatment devices.**

6. Does your water have an unpleasant taste? ☐ yes ☐ no

→ **If YES**, how would you describe the taste? Check **all** that apply:
☐ bitter ☐ sulfur ☐ salty ☐ metallic ☐ oily ☐ soapy ☐ other → specify: _________

8. Does your water have an objectionable odor? ☐ yes ☐ no

→ **If YES**, how would you describe the odor? Check **all** that apply:
☐ "rotten egg" or sulfur ☐ kerosene ☐ musty ☐ chemical ☐ other → specify: __________

9. Does your water have an unnatural color or appearance? ☐ yes ☐ no

→ **If YES**, how would you describe the color or appearance? Check **all** that apply:
☐ muddy ☐ milky ☐ black/gray tint ☐ yellow tint ☐ oily film ☐ other → specify: _________

10. Does your water stain plumbing fixtures, cooking appliances/utensils, or laundry? ☐ yes ☐no

→ **If YES**, how would you describe the color of stains? Check **all** that apply:
☐ blue-green ☐ rusty (red/orange/brown) ☐ black or gray ☐ white/chalk ☐ other → specify: ____

11. In a standing glass of water, do you notice floating, suspended, or settled particles? ☐ yes ☐ no

→ **If YES**, how would you describe this material? Check **all** that apply:
☐ white flakes ☐ black specks ☐ reddish-orange slime ☐ brown sediment ☐ other → specify: ___

12. Is your water supply located **within 100 feet of the following?** Check **all** that apply:

☐ septic system drain field
☐ pit privy or outhouse
☐ cemetery
☐ home heating oil storage tank (above or below ground)
☐ pond or freshwater stream
☐ tidal shoreline or marsh

13. Is your water supply located **within a ½ mile of any of the following**? Check **all** that apply:

☐ landfill
☐ illegal dump
☐ active quarry
☐ golf course
☐ field crops/nursery
☐ manufacturing/processing operation → specify type:_______________
☐ abandoned quarry, industry, etc.
☐ farm animal operation
☐ commercial underground storage tank or supply lines (gas service station, heating oil supplier, etc.)

APPENDIX B. Raw Data

Table B1. Fluorometer Readings

Sample #	Reading	Sample #	Reading	Sample #	Reading
180	33.40	243	4.20	291	0.24
181	19.10	244	0.20	292	2.30
182	20.50	245	2.07	293	3.20
183	35.00	246	1.01	294	0.54
184	34.80	247	0.93	295	1.38
185	3.79	248	8.99	296	0.24
186	41.20	249	0.00	297	0.41
187	30.10	250	0.69	298	90.00
188	1.41	251	0.34	299	1.90
189	41.00	252	0.00	300	0.35
190	31.30	253	0.80	301	1.08
191	9.67	254	0.59	302	0.51
192	16.00	255	0.19	303	0.01
193	9.15	256	0.00	304	0.37
194	6.90	257	1.05	305	0.49
195	0.31	258	0.00	306	2.04
205	0.75	259	2.05	307	0.17
206	1.20	260	1.31	308	0.15
207	0.00	261	0.28	309	0.00
208	1.40	262	10.60	310	9.78
209	0.22	263	0.18	311	0.00
210	0.57	264	N/A	312	0.00
211	1.62	265	0.40	313	0.40
212	0.67	266	0.46	314	2.00
213	0.53	267	0.30	315	0.50
214	0.73	268	0.70	316	2.25
215	N/A	269	0.58	317	1.15
216	0.32	270	1.79	318	1.27
217	1.47	271	5.00	319	12.10
218	10.90	272	N/A	320	1.38
219	1.92	273	0.49	321	1.42
220	0.26	274	0.58	322	1.38
221	0.30	275	0.00	323	0.20
222	1.30	276	0.00	324	0.01
223	1.35	277	0.26	325	0.00
224	0.19	278	1.30	326	1.04
225	0.00	279	3.30	327	1.22
226	1.32	280	21.90	328	0.92
227	6.26	281	0.74	329	6.80
228	3.60	282	7.93	330	19.20
229	0.62	283	1.01	331	0.24
236	0.50	284	1.07	332	5.81
237	0.60	285	1.72	333	3.23
238	0.26	286	2.10	334	0.39
239	1.35	287	1.70	335	2.29
240	0.27	288	1.06	336	N/A
241	0.81	289	1.54	337	N/A
242	5.40	290	2.09	338	10.10

Sample #	**Reading**	**Sample #**	**Reading**	**Sample #**	**Reading**
339	3.60	387	0.28	435	1.20
340	0.61	388	N/A	436	0.68
341	0.52	389	0.96	437	29.30
342	0.42	390	0.45	438	0.39
343	0.64	391	0.53	439	2.00
344	0.42	392	0.02	440	0.20
345	3.95	393	1.01	441	0.35
346	1.24	394	1.06	442	0.53
347	0.16	395	0.28	443	1.62
348	0.30	396	N/A	444	3.55
349	2.06	397	0.69	445	1.43
350	3.28	398	0.30	446	2.40
351	0.06	399	8.93	447	1.20
352	0.33	400	8.68	448	0.00
353	1.32	401	0.00	449	0.92
354	0.28	402	0.14	450	1.61
355	3.37	403	0.30	451	4.17
356	1.03	404	N/A	452	N/A
357	0.35	405	8.65	453	11.20
358	36.50	406	1.33	454	0.00
359	56.80	407	0.00	455	0.77
360	5.76	408	0.58	456	0.05
361	1.75	409	0.23	457	0.00
362	12.60	410	0.35	458	0.00
363	1.90	411	0.00	459	0.33
364	1.48	412	0.52	460	0.00
365	4.00	413	N/A	461	5.60
366	0.46	414	0.90	462	8.30
367	3.99	415	0.26	463	0.10
368	0.99	416	4.17	464	0.32
369	1.14	417	N/A	465	2.70
370	0.00	418	7.68	466	1.55
371	0.00	419	11.20	467	0.78
372	0.31	420	0.04	468	0.00
373	0.00	421	1.64	469	1.10
374	0.34	422	1.22	470	0.11
375	0.14	423	0.00	471	N/A
376	4.58	424	0.12	472	2.80
377	6.55	425	2.30	473	0.23
378	0.11	426	1.36	474	2.25
379	0.00	427	N/A	475	2.69
380	N/A	428	0.07	476	3.66
381	0.41	429	0.42	477	0.32
382	0.08	430	N/A	478	0.83
383	0.48	431	0.40	479	0.14
384	2.14	432	0.33	480	1.80
385	0.00	433	0.70	481	0.00
386	N/A	434	8.10	482	8.00

Sample #	Reading	Sample #	Reading
483	8.80	531	0.00
484	0.00	532	0.54
485	0.16	533	0.35
486	0.13	534	0.37
487	24.50	535	1.22
488	0.31	536	1.65
489	0.26	537	0.13
490	0.00	538	0.28
491	0.00	539	2.30
492	6.66	540	0.88
493	0.45	541	0.49
494	0.60	542	0.16
495	0.17	543	0.50
496	0.36	544	17.30
497	0.67	545	4.60
498	1.28	546	29.80
499	1.35	547	1.12
500	1.80	548	0.03
501	63.80	549	1.75
502	0.74	550	4.25
503	1.50	551	0.28
504	0.56	552	0.29
505	9.10	553	0.20
506	0.84	554	0.02
507	1.50	555	2.65
508	0.20	556	1.12
509	2.30	557	11.80
510	0.73	558	1.64
511	1.95	559	0.30
512	0.81	560	0.05
513	1.50	561	0.00
514	3.75	562	0.23
515	1.40	563	1.80
516	0.80	564	0.86
517	0.73	565	2.02
518	0.65	566	5.15
519	1.47		
520	0.98		
521	1.43		
522	1.33		
523	18.20		
524	N/A		
525	0.70		
526	2.13		
527	9.05		
528	0.62		
529	0.28		
530	0.55		

Table B2. Raw Chemical Data

Sample#	County	pH	TDS	NO3N	Cl-	Flouride	Calcium	Mg	Na	Sulfur	Mn	Copper	Iron	Sulfate	Hardness
1	Smyth	6.84	288.2	0.47	4.8	0.2	149	9.6	1.7	2	0.01	0.005	0.052	6	411.6
2	Smyth	6.77	509.4	1.29	12.1	0.22	106.4	38.7	6.6	1.9	0.006	0	0.029	5.7	425
3	Smyth	7.29	95.3	0.31	4.4	0	64.5	7.1	1.9	2.3	0.016	0.016	0.157	6.9	190.3
4	Smyth	7.37	241.3	0.32	5.4	0.31	53.1	20.4	5.1	1.2	0.004	0.016	0.014	3.6	216.6
5	Smyth	7.34	207.8	0.55	2.9	0	67.5	18.1	1	1.2	0.076	0.006	0.464	3.6	243.1
6	Smyth	6.91	1011.8	0.7	222.9	0.35	140.1	28.6	161	8.4	0.013	0.017	0.147	25.2	467.6
7	Smyth	7.24	295	0.56	5	0.27	84.1	12.8	1.3	2.5	0.006	0.006	0.01	7.5	262.7
8	Smyth	7.1	395.5	2.07	10.5	0.25	94.3	20.4	4.5	3.4	0.005	0.018	0.038	10.2	319.5
9	Smyth	7.44	315.1	0.46	10.4	0	80.7	26.5	3.7	2.4	0.014	0	0.047	7.2	310.6
10	Smyth	7.28	328.5	0.64	3.5	0.16	104.3	29.8	0.9	1.5	0.014	0.005	0.031	4.5	383.2
11	Smyth	7.04	341.9	0.12	5.2	0.2	116.9	9.8	3	3.7	0.008	0.005	0.076	11.1	332.3
12	Smyth	7.15	730.5	0.37	153	0.14	25.1	0.5	240.6	3.9	0.006	0	0.022	11.7	64.7
13	Smyth	7.2	288.2	0.31	1.4	0.15	93.6	17.3	0.8	4	0.011	0	0.028	12	305
14	Smyth	7.79	161	0.18	1.5	0.24	55.3	15.2	0.4	1.4	0.009	0.004	0.026	4.2	200.7
15	Smyth	7.16	74.5	0.16	1.4	0.13	35.7	6.4	0.7	1.5	0.02	0.006	0.065	4.5	115.5
16	Smyth	7.59	241.4	0	1.3	0	76.4	22.9	0.7	7.5	0.018	0.009	0.035	22.5	285.1
17	Smyth	7.29	207.9	0.57	3.5	0.3	79.4	13.6	1.4	3.4	0.02	0.008	0.07	10.2	254.3
18	Smyth	7.17	73.8	0.15	1.3	0	42.8	5.5	1.2	1.8	0.01	0.041	0.21	5.4	129.5
19	Smyth	4.07	84.6	0	0.4	0	35.2	1	0.6	12.4	0.019	0.381	0.817	37.2	92
20	Smyth	8.1	110	0.04	0.5	0.12	44.2	10.2	0.4	0.8	0.008	0.004	0.029	2.4	152.4
21	Smyth	6.79	281.5	0.48	6.1	0.21	93.2	9.3	2.2	1.6	0.007	0.009	0.051	4.8	271
22	Smyth	7.06	355.2	0.62	8.5	0.39	88.6	29.6	4.5	14	0.012	0.032	0.173	42	343.1
23	Russell	6.9	408.8	0.22	18.4	0.32	109.6	26.1	6	9.4	0.006	0.011	0.011	28.2	381.2
24	Russell	7.54	221.2	0.37	5.1	0.14	72.8	19.6	3.6	2.9	0.012	0.086	0.04	8.7	262.5
25	Russell	7.07	348.5	0.98	21.7	0	75.2	28.7	10	0.9	0.007	0.006	0.021	2.7	306
26	Russell	7.24	207.8	0.32	4.9	0	76.8	19.1	2.3	0.7	0.008	0.006	0.032	2.1	270.4
27	Tazewell	7.15	241.3	0.75	4.1	0.15	112.7	6.6	1.2	1.6	0.009	0	0.043	4.8	308.6
28	Tazewell	6.91	187.7	0.12	1.3	0.13	68.7	2.1	1.1	1	0.004	0.005	0.025	3	180.2
29	Russell	7.34	227.9	0.33	2.4	0.32	70.1	17.7	1.5	1	0.008	0	0.027	3	247.9
30	Tazewell	7.16	241.3	1.09	7.2	0.16	96	5.7	2.6	2.9	0.016	0.008	0.166	8.7	263.2
31	Tazewell	7.72	147.5	0.21	1.3	0.13	63.7	14.6	0.4	0.9	0.013	0.006	0.064	2.7	219.2
32	Tazewell	7.36	261.4	0.25	2.1	0	82.1	23.9	0.8	1.4	0.013	0.006	0.111	4.2	303.4
33	Tazewell	7.03	124.1	0.18	1	0.13	66.3	1.9	1	4.1	0.008	0.004	0.041	12.3	173.4
34	Tazewell	6.91	214.5	1.26	8	0.13	79.8	2.3	3.9	2.2	0.007	0.006	0.027	6.6	208.7

Sample#	County	pH	TDS	NO3N	Cl-	Flouride	Calcium	Mg	Na	Sulfur	Mn	Copper	Iron	Sulfate	Hardness
36	Tazewell	7.44	321.7	0.3	2.3	0.59	33.6	0.7	99	2.5	0.013	0	0.033	7.5	86.8
37	Tazewell	7.39	140.8	0.12	1.1	0.07	56.3	1.8	1.2	3	0.029	0.1	0.179	9	148
40	Frederick	7.31	221.3	0.14	14.9	0.13	40.6	0.6	68.2	2	0.01	0.005	0.044	6	103.8
41	Frederick	6.61	154.3	0	2.2	0.11	27.5	6.7	9.3	1.3	0.521	0.005	0.069	3.9	96.3
42	Frederick	6.74	630	2.92	32.9	0.13	2.6	0.1	200	7.6	0	0.027	0	22.8	6.9
43	Frederick	6.52	221.3	0	28.7	0	23	0.3	61.8	3.3	0.006	0.007	0.036	9.9	58.7
44	Frederick	6.82	496	1.73	15.3	0.09	5.9	0.1	158.3	4.6	0	0.008	0.013	13.8	15.1
45	Frederick	6.85	683.6	0.19	17.8	0.13	52.7	0.6	189.9	72.7	0.007	0.016	0.278	218.1	134.1
46	Frederick	7.65	368.6	0.45	26.6	0.14	4.9	0.1	105.8	18.6	0.002	0.122	0.038	55.8	12.6
47	Frederick	6.75	991.8	9.71	182.7	0.11	28.9	0.5	290.4	11.2	0.008	0.024	0.055	33.6	74.2
48	Frederick	6.82	670.2	3.75	56.6	0.09	65.7	0.6	195.1	5.9	0.007	0.019	0.074	17.7	166.5
49	Frederick	7.15	496	2.73	14.7	0.4	27.2	1.2	151.6	9	0.007	0.05	0.027	27	72.9
50	Clarke	7.09	589.7	2.04	57.5	0	19.6	0.2	177.5	5	0.003	0.005	0.014	15	49.8
51	Frederick	7.04	837.6	0.15	10.6	0.14	185.6	32.6	21.5	115.8	0.151	0.005	0.051	347.4	597.7
52	Frederick	7.04	630	2.08	13.8	0	2	0.7	205.3	7.1	0	0.038	0.009	21.3	7.9
53	Frederick	7.52	201.2	0	1.1	0.09	1	0.1	63.3	3.7	0	0.004	0.068	11.1	2.9
54	Frederick	7.24	435.7	0.73	7.8	0.12	23.1	0.4	137.7	11.7	0.005	0.009	0.026	35.1	59.3
55	Frederick	7.58	368.6	0	2	0.2	7.5	0.1	107	21.5	0.002	0	0.01	64.5	19.1
56	Clarke	7.38	469.2	0.37	7.9	0.19	46.5	0.5	146.7	9	0.005	0.011	0.01	27	118.2
57	Frederick	7.13	683.6	2.92	66.3	0.19	6.4	0.1	201.6	13.1	0	0.014	0.01	39.3	16.4
58	Frederick	7.71	174.4	1.2	1.1	0.38	40	10.2	1	0.7	0.002	0.007	0.018	2.1	141.9
59	Clarke	6.84	495.9	7.84	9.7	0.09	112.2	13.3	4.2	9.5	0	0.034	0.021	28.5	334.9
60	Clarke	7.46	181	0	1.5	0.12	39.9	8	10.3	3.2	0.058	0	0.033	9.6	132.6
61	Frederick	6.78	415.5	4.27	7	0.09	100.3	6.3	2.5	2.1	0.002	0.017	0.019	6.3	276.4
62	Frederick	7.38	301.7	0.16	2.1	0.09	2.1	0.1	93.4	1.8	0	0.029	0.043	5.4	5.7
63	Frederick	7.03	697	0.3	10	0.17	2.4	0.2	201.5	66.9	0	0.01	0.021	200.7	6.8
64	Frederick	6.88	616.6	3.09	40	0.08	2.9	1	178.5	6.8	0	0.007	0	20.4	11.4
65	Clarke	6.78	603.2	9.9	21.7	0.44	100	39.2	7	11.3	0	0.029	0.009	33.9	411.1
66	Frederick	7.11	415.5	0	45.5	0.06	2.4	1	109.7	22.6	0.007	0.004	0.071	67.8	10.1
67	Clarke	7.11	395.4	10.81	8.4	0.42	91.8	21.8	1.9	5.7	0.002	0.007	0.015	17.1	319
68	Clarke	6.93	462.4	4.08	5.3	0.19	85.3	23.2	2.6	2.7	0	0.013	0.009	8.1	308.5
69	Clarke	7.57	234.6	1.77	2	0.25	69.2	15.7	2.7	3.3	0.004	0.008	0.022	9.9	237.4
70	Clarke	7.38	281.5	1	1.1	0.51	114.9	18.4	1.1	4.2	0.012	0.015	0.067	12.6	362.7
71	Clarke	7.28	301.6	0.99	2.3	0.18	45.9	22.3	2.4	1.9	0	0.008	0	5.7	206.4
72	Clarke	6.94	469.1	3.48	15.5	0.25	88.4	26.6	6.5	4	0	0.016	0.012	12	330.3
73	Clarke	7.81	294.9	2.96	4	0.12	7	0.1	89.6	0.9	0.002	0.028	0.047	2.7	17.9

Sample#	County	pH	TDS	NO3N	Cl-	Flouride	Calcium	Mg	Na	Sulfur	Mn	Copper	Iron	Sulfate	Hardness
74	Clarke	6.86	583	1.99	39.7	0.21	39.7	19.8	91.1	4.6	0	0.018	0	13.8	180.7
75	Frederick	7.24	368.6	0.24	24.2	0.17	2	0.1	101.5	16.8	0	0	0	50.4	5.4
76	Frederick	5.76	61.1	0.22	0.6	0.08	13.4	4.8	5.2	2.3	0.197	0.035	0.55	6.9	53.2
77	Frederick	6.97	402.1	2.47	2.6	0.17	30.3	0.3	123.3	1.6	0.003	0	0.01	4.8	76.9
78	Frederick	6.81	516	5.44	21.6	0.08	3.4	0	143.2	5.1	0	0	0.012	15.3	8.5
79	Frederick	6.99	462.4	5.13	11	0.19	14.3	0.8	131.4	9.7	0	0.012	0	29.1	39
80	Frederick	7.07	395.4	0	87.5	0.13	31.5	0.3	103.8	2.5	0.004	0	0.016	7.5	79.9
81	Frederick	7.17	542.8	4.13	45.8	0.25	1.6	0.1	159.3	8.7	0	0	0	26.1	4.4
82	Frederick	7.03	629.9	4.24	71.2	0.2	3	0	177.5	17	0	0.013	0.011	51	7.5
83	Clarke	6.9	562.9	7.86	14	0.2	3.5	0.1	158.6	9.6	0	0	0	28.8	9.2
84	Frederick	7.19	576.3	0.14	55.6	0.07	6.4	0.1	162.7	21.2	0.003	0.005	0.096	63.6	16.4
85	Frederick	6.45	248	0	18.4	0.08	4.9	0.7	69.4	0.6	0.046	0.004	0.117	1.8	15.1
86	Clarke	7.04	509.3	5.88	20.5	0.18	13.7	0.2	139.3	7.9	0.003	0.028	0.026	23.7	35
87	Clarke	6.96	449	0.46	11.9	0.09	115.6	10.8	6.4	11.4	0.006	0.019	0.014	34.2	333.1
88	Clarke	6.72	676.8	8.07	67.3	0.07	145.5	9.7	27.8	8.7	0	0.012	0.011	26.1	403.3
89	Frederick	6.43	227.9	1.27	13.7	0.07	44.3	5.2	12.8	5	0.006	0.07	0.022	15	132
90	Frederick	7.4	361.9	0.15	30.7	0.21	4.4	0.2	102.9	16.4	0	0.01	0.014	49.2	11.8
92	Scott	7.13	207.8	0.22	1	0.08	101.5	3	1.9	7.2	0.007	0.045	0.036	21.6	265.8
93	Scott	7.14	147.5	0.07	0.7	0.1	30.7	6	3.4	3.2	0.047	0.036	0.411	9.6	101.4
94	Scott	7.43	248	1.03	1.9	0.12	49.6	19.6	0.8	3.7	0.002	0.008	0.021	11.1	204.6
95	Scott	7.53	241.3	0.77	1	0.12	38.9	18.9	0.5	2.4	0.002	0.011	0.016	7.2	175
96	Scott	7.49	241.3	1.37	1.4	0.07	41.6	19.2	0.7	2.1	0	0.007	0.008	6.3	182.9
97	Scott	7.39	241.3	0.98	18.9	0.08	62	10.8	5.9	3.3	0.003	0.01	0.028	9.9	199.3
98	Scott	7.51	274.8	1.17	2.1	0.22	45.6	21.8	0.8	2.9	0.002	0.005	0	8.7	203.6
99	Scott	7.57	241.3	0.22	0.9	0.09	63.8	20.2	0.7	2.7	0.004	0.007	0.061	8.1	242.5
100	Scott	7.23	281.5	0.25	0.9	0.05	109	7.1	0.5	1.9	0.007	0.007	0.161	5.7	301.4
101	Lee	7.71	294.9	0.27	4.2	0.45	54.4	20.2	2	5	0.002	0.008	0.039	15	219
102	Lee	7.61	361.9	0.83	24.4	0.45	49	12.9	44.7	9.4	0.003	0.013	0.064	28.2	175.5
103	Lee	7.59	261.4	2.74	5	0.08	46	21.3	1.5	3.1	0	0.005	0.014	9.3	202.6
104	Lee	7.37	382	0.62	1.2	0.14	57.1	27.9	9.2	4.8	0.003	0.011	0.008	14.4	257.5
105	Lee	7.07	71.8	0.21	0.5	0.05	28.9	3.6	0.9	2	0.006	1.416	0.079	6	87
106	Lee	7.7	281.5	2.91	16.7	0.25	44.2	13.6	11.6	8.2	0.002	0.03	0.029	24.6	166.4
107	Lee	7.48	382	0.05	5.2	0.15	79.9	23.9	10.6	19.6	0.007	0.09	0.265	58.8	297.9
108	Lee	7.44	274.8	3.64	3.7	0.13	67.2	4.5	3.7	4.3	0	0	0.013	12.9	186.3
109	Lee	7.22	355.2	5.31	13.9	0.07	58.8	24.2	5.9	3	0.002	0.004	0.012	9	246.5
110	Lee	7.54	341.8	10.51	13.7	0.08	71.9	14.4	2.2	0.6	0.005	0.011	0.027	1.8	238.8

Sample#	County	pH	TDS	NO3N	Cl-	Flouride	Calcium	Mg	Na	Sulfur	Mn	Copper	Iron	Sulfate	Hardness
111	Loudoun	6.76	281.6	1.99	12.9	0.1	8.9	0.1	88.8	4.7	0	0.021	0	14.1	22.6
112	Loudoun	6.27	207.9	5.62	7.6	0.09	35.8	7.5	13.2	13.4	0.032	0.064	0.639	40.2	120.3
113	Loudoun	6.94	234.7	0	18.6	0.15	35.6	9.7	6.7	4	0.157	0	0.855	12	128.8
114	Loudoun	6.98	147.6	0	4.2	0.25	23.6	7.5	4.8	7.3	0.14	0	0.672	21.9	89.8
115	Loudoun	6.46	147.6	1.47	5.5	0.08	71.7	1.2	43.2	11.7	0.022	0.033	0.078	35.1	184
116	Loudoun	7.08	757.3	0	5.8	0.39	38.7	0.7	235.7	70.4	0.012	0	0.018	211.2	99.5
117	Loudoun	7.25	268.2	9.5	25.4	0.02	34.5	13	5.4	4.7	0.004	0.013	0.015	14.1	139.7
118	Loudoun	6.78	154.3	1.45	5.7	0.29	22.3	6.1	7	6.8	0.002	0.006	0	20.4	80.8
119	Loudoun	7.78	174.4	0	5.7	1.25	24	6	15.9	2.4	0.018	0	0.123	7.2	84.6
120	Loudoun	6.67	140.9	4.39	5.6	0.4	57	5	8.2	4.8	0.009	0.103	0.056	14.4	162.9
121	Loudoun	7.33	254.8	0.3	8	0.1	45.1	10.6	5.9	4.9	0	0	0.011	14.7	156.3
122	Loudoun	7.25	268.2	0	4.7	0.1	41.1	15.3	6.3	4.4	0.002	0.004	0	13.2	165.6
123	Loudoun	6.16	76.6	0.68	2.6	0.07	10.9	3.4	6.1	1.8	0.011	0.028	0.053	5.4	41.2
124	Loudoun	6.28	174.4	6.21	9.8	0.06	19.6	9.6	8.8	4.6	0.014	0.358	0	13.8	88.5
125	Loudoun	7.54	228	0	2.2	0.93	41.9	9.1	9.1	4	0.068	0	0.135	12	142.1
126	Loudoun	7.09	234.7	7.68	9.5	0.06	31	12.2	7.6	7.4	0	0.012	0	22.2	127.6
127	Loudoun	7.33	328.5	0.21	5.6	0.08	43.4	24.6	14.4	5.2	0.003	0.013	0	15.6	209.7
128	Loudoun	7.36	341.9	1.45	25.7	0.09	55.6	12.3	16	1.7	0	0.006	0	5.1	189.5
129	Loudoun	7.67	174.4	0.23	5.2	0.24	29.8	6	5.2	3.5	0.004	0.024	0.021	10.5	99.1
130	Loudoun	6.75	124.1	1.3	3.5	0.08	0.1	0	36.1	5.4	0	0.006	0	16.2	0.2
131	Loudoun	6.69	174.4	6.22	9.6	0.07	24.9	8.8	7.1	5.8	0.002	0.013	0	17.4	98.4
132	Loudoun	6.36	140.9	2.07	7.9	0.11	18.4	5.6	6.2	4.7	0.024	0.02	0.009	14.1	69
133	Loudoun	6.7	281.6	0	5.7	0.09	47.6	13.4	7.2	5.2	0.243	0	0.032	15.6	174
134	Loudoun	7.31	321.8	0	5.1	0.12	38.2	24	8.6	5.3	0.023	0.004	0.072	15.9	194.2
135	Loudoun	6.91	221.3	0.22	8.9	0.13	32.4	9.3	6.7	9	0.006	0.03	0.413	27	119.2
136	Loudoun	7.28	248.1	5.76	36.9	0.04	40.6	8.1	5.6	0.6	0.007	0	0.205	1.8	134.7
137	Loudoun	6.85	656.8	3.01	14.8	0.11	2.3	0.1	210	34.1	0	0.021	0	102.3	6.2
138	Loudoun	7.21	382.1	1.23	38.1	0.03	58.4	18.2	14.4	2.6	0	0.016	0.02	7.8	220.8
139	Loudoun	6.86	161	2.85	5.8	0.15	15	13.8	6.7	6.6	0.007	0.067	0.01	19.8	94.3
140	Loudoun	7.62	174.4	0	1.4	0.29	29.1	5.7	9.8	2.8	0.089	0	0.093	8.4	96.1
141	Loudoun	7.76	174.4	0.08	6.4	0.11	2	0	52.8	4.2	0	0	0.01	12.6	5
142	Loudoun	7.34	241.4	3.11	6.2	0.05	51.1	6.4	7.8	3.6	0.002	0.01	0.008	10.8	154
143	Loudoun	6.98	207.9	0.1	11.1	0.07	27.9	14	8.5	4.9	0.003	0.007	0.013	14.7	127.3
144	Loudoun	6.68	375.4	1.11	73.4	0.04	56.1	17.5	13.3	6.6	0.002	0.011	0.012	19.8	212.1
145	Loudoun	6.11	234.7	1.62	55.6	0.07	14.5	4.2	39.3	6.9	0.008	0.211	0.024	20.7	53.5
146	Loudoun	7.46	268.2	2.19	18.2	0.05	36.1	16.8	8.9	2.2	0	0	0	6.6	159.3

Sample#	County	pH	TDS	NO3N	Cl-	Flouride	Calcium	Mg	Na	Sulfur	Mn	Copper	Iron	Sulfate	Hardness
147	Loudoun	7.63	181.1	1.86	3.6	0.02	42.9	11.8	2.2	0.8	0.005	0.029	0.022	2.4	155.7
148	Loudoun	6.56	79.3	0	21.3	0	1.3	0.1	20.5	0.2	0.012	0.005	0	0.6	3.7
149	Loudoun	7	301.7	8.03	12.7	0.03	57.6	13.2	3.9	1.8	0	0.02	0	5.4	198.2
150	Loudoun	7.3	268.2	0.12	9.6	0.13	54	14.9	7	8.4	0.006	0.075	0.024	25.2	196.2
151	Loudoun	6.53	241.4	3.16	11.6	0.09	33.6	21	7.7	6.4	0.002	0.01	0.011	19.2	170.4
152	Loudoun	6.02	41.1	0.1	2.1	0.04	13.3	2.5	2.7	0.8	0.003	1.262	0.01	2.4	43.5
153	Loudoun	6.73	228	0.03	9.1	0.17	31.2	13.3	6.8	4.3	0.019	0.019	0.104	12.9	132.7
154	Loudoun	7.15	549.6	1.5	86.5	0.04	2.3	0.1	165.7	4.4	0	0	0	13.2	6.2
155	Loudoun	6.63	134.2	0.08	2	0.15	22.1	5.6	5.2	6.5	0.013	0.101	0	19.5	78.2
156	Loudoun	7.54	167.7	0	7.2	0.21	28.5	5.1	6	5.1	0.188	0	0.016	15.3	92.2
157	Loudoun	6.13	85.9	3.62	7.8	0.04	16.6	5	5.7	0.4	0.004	0.152	0	1.2	62
158	Loudoun	6.06	114.1	5.86	14.6	0.02	11.9	4.6	7.3	0.2	0.003	5.719	0	0.6	48.7
159	Loudoun	7.39	221.3	0.61	5.5	0.1	32.2	8.8	17.1	10.4	0.002	0	0.106	31.2	116.6
160	Loudoun	7.4	241.4	1.09	4.9	0.05	40.4	11	6.9	1.4	0	0	0.013	4.2	146.2
161	Loudoun	7.51	108	0.08	1.4	0.08	19.9	4.4	6.2	1.1	0.003	0.014	0.094	3.3	67.8
162	Loudoun	7	489.3	0.28	31.8	0.03	102.2	17.1	15.6	4.1	0.003	0	0.05	12.3	325.6
163	Loudoun	7.75	154.3	1.48	3.9	0.02	31.4	3.9	5	2.7	0	0	0	8.1	94.5
164	Loudoun	7.67	207.9	1.32	19.1	0.07	1.5	0.1	59.9	2.8	0	0.042	0	8.4	4.2
165	Loudoun	7.71	221.3	0	2.5	0.11	2.8	0.1	65.5	4.7	0	0	0.033	14.1	7.4
166	Loudoun	6.07	73.2	0.99	6.4	0.04	19.2	2.5	3.4	2.2	0.003	0.326	0.008	6.6	58.2
167	Loudoun	5.98	154.3	2.12	7.7	0.02	18.7	10.8	5.1	7.5	0	0.04	0	22.5	91.2
168	Loudoun	7.58	167.7	0.03	3.6	0.17	31.5	4.3	6.8	2.1	0.149	0	0	6.3	96.4
169	Loudoun	7.29	355.3	8.32	29.5	0.22	0.8	0	103.6	2.1	0	0.006	0	6.3	2
180	Isle of Wight	8.1	328.5	0	3.1	2.93	8.4	0.3	105.5	1.4	0.004	0	0	4.2	22.2
181	Isle of Wight	8.1	254.8	0	1.3	1.7	0.5	0.1	83.1	1.9	0	0	0	5.7	1.7
182	Isle of Wight	8.2	274.9	0	1.6	2.27	3.6	0.2	85.6	1.9	0.003	0.004	0	5.7	9.8
183	Isle of Wight	8.2	529.5	0	26.5	4.24	12.2	0.4	160.3	2.9	0.005	0.007	0	8.7	32.1
184	Isle of Wight	8.3	455.8	0	9.5	3.38	1.4	0.3	147.1	1.6	0.003	0	0	4.8	4.7
185	Isle of Wight	7.5	274.9	0	10.6	0.05	71.5	3.1	4.9	7.4	0.013	0	0.05	22.2	191.3
186	Isle of Wight	8.3	529.5	0	5.3	4.26	10.8	1	169.3	1.1	0.009	0	0.018	3.3	31.1
187	Isle of Wight	8.3	395.5	0	1.7	2.83	1.2	0.4	127.4	0.2	0.003	0	0	0.6	4.6
188	Isle of Wight	7	308.4	3.29	15.3	0.04	76.4	2.2	4.3	2	0	0.102	0	6	199.8
189	Isle of Wight	8.2	469.2	0	4.7	3.81	5.6	0.5	148.8	1.1	0.004	0.006	0	3.3	16
190	Isle of Wight	8.2	355.3	0	1.8	3.81	1.1	0.2	114.5	1.4	0.002	0	0	4.2	3.6
191	Isle of Wight	7.3	268.2	0.05	3.7	0.2	82.5	3.4	9	1.8	0.009	0	0.021	5.4	220
192	Isle of Wight	8.3	261.5	0	1.3	1.27	0.3	0.1	77.9	2.6	0.003	0	0.028	7.8	1.2

Sample#	County	pH	TDS	NO3N	Cl-	Flouride	Calcium	Mg	Na	Sulfur	Mn	Copper	Iron	Sulfate	Hardness
193	Isle of Wight	8.3	328.5	0	5.3	2.14	4.1	0.3	101.5	1.5	0.002	0.007	0	4.5	11.5
194	Isle of Wight	7.7	181.1	0	4	0.08	81.4	1.8	5.1	3.6	0.031	0.006	0.166	10.8	210.7
195	Isle of Wight	5.1	154.3	0.15	2.7	0	3.5	0.3	1.7	0.2	0.004	0.045	0	0.6	10
205	Lunenburg	5.76	67.8	2.2	4.4	0.06	4.2	1.7	6.7	0	0.003	0.071	0	0	17.5
206	Lunenburg	6.49	315	0.36	23.4	0.06	28.6	16.6	17	7.3	0	0.02	0	21.9	139.8
207	Lunenburg	6.6	160.9	0	1.7	0.1	0.1	0	39.9	3.3	0	0	0	9.9	0.2
208	Lunenburg	5.45	73.2	0	4.8	0	17.8	2.2	3.3	0.2	0.021	0.178	0.021	0.6	53.5
209	Lunenburg	6.08	91.9	0.35	5.2	0.02	16.8	3.2	8.9	0.2	0.003	0.179	0	0.6	55.1
210	Lunenburg	6.03	116	3.51	6.7	0.27	5.9	1.8	8	1.5	0.003	12.198	0	4.5	22.1
211	Lunenburg	5.76	67.8	2.2	4.4	0.06	4.2	1.7	6.7	0	0.003	0.071	0	0	17.5
212	Buckingham	6.01	100.6	0.68	2.8	0	12.1	5.6	4.4	0.2	0	0.02	0.019	0.6	53.3
213	Buckingham	5.45	60.4	1.63	3.4	0	6	1.3	4.2	0	0.004	0.131	0	0	20.3
214	Buckingham	6.1	76.5	0.03	1.8	0	5.9	4.7	5.4	0.2	0	0.024	0	0.6	34.1
215	Buckingham	5.42	24.2	0.1	1.4	0	6.6	1.2	2.5	0.2	0.002	0.111	0.017	0.6	21.4
216	Buckingham	6.02	128.1	3.64	10.4	0.02	15.3	2.8	6.5	1.5	0.004	0.028	0	4.5	49.7
217	Buckingham	5.89	30.3	0	3.9	0.01	2	1.5	2	0.1	0.211	0	18.44	0.3	11.2
218	Buckingham	6.81	341.8	0	6.4	0.19	47.4	12.7	12.2	5.3	0.366	0.02	0.854	15.9	170.7
219	Buckingham	6.03	201.1	0	22.2	0.05	24.2	6.9	10.9	3.2	0.004	0.103	0.061	9.6	88.8
220	Buckingham	5.76	126.7	0	22.7	0	9.2	4.3	7.8	0.4	0.004	0.038	0	1.2	40.7
221	Buckingham	6.09	81.2	0.43	2.7	-0.03	12	3	7.3	0	0	0.105	0.023	0	42.3
222	Buckingham	5.95	94.6	2.28	3.2	0	9.2	3.1	7.6	1.3	0	0.046	0.117	3.9	35.7
223	Buckingham	7.32	328.4	0.26	5	0.22	53.6	9.5	8.8	1.8	0	0.01	0	5.4	173
224	Buckingham	6.93	187.7	0	1.2	0.09	41.5	6	5.9	2	0.14	0.005	3.909	6	128.3
225	Buckingham	5.61	20.2	0	0.9	0.02	8.5	1	1.5	0.3	0.003	0.021	0	0.9	25.3
226	Buckingham	6.01	102	1.56	3.9	0.04	6.5	4.7	7.5	3	0	0.03	0	9	35.6
227	Buckingham	5.97	160.9	0	11.2	0.02	17	4.5	7.6	0.9	0.003	0.324	0.116	2.7	61
228	Buckingham	5.81	108.7	0.89	6.7	0.04	18.4	4	8.3	1.6	0.033	0.013	0.86	4.8	62.4
229	Buckingham	5.98	64.4	0.5	6	0	6.9	1	5	0	0	0.046	0	0	21.3
236	Louisa	5.76	84.5	0.02	2.4	0.05	11.8	3.7	8.1	0.4	0.073	0	0	.	1.2
237	Spotsylvania	7	160.9	0	1.2	0.14	28.4	7.7	9	1.4	0.055	0	0	.	4.2
238	Spotsylvania	6.05	59.1	0	0.9	0.17	0	0	19	4.1	0	0	0.009	.	12.3
239	Spotsylvania	5.88	56.4	0.5	2.2	0.05	9.9	1.3	4.1	0.2	0.008	0.127	0.035	.	0.6
240	Spotsylvania	5.52	51.7	0.4	3.5	0.05	5.9	1.6	5.5	0.3	0.005	0.13	0	.	0.9
241	Spotsylvania	5.55	26.9	0.71	1.5	0.12	4.5	0.4	1.8	0.2	0.006	0.023	0.014	.	0.6
242	Fredericksburg	6.97	126.8	0	1.8	0.22	0	0	45.3	2.1	0	0	0.183	.	6.3
243	Spotsylvania	6.25	63.1	0	0	0	11.1	0.4	7.4	0.8	0.005	0.168	0.026	.	2.4

Sample#	County	pH	TDS	NO3N	Cl-	Flouride	Calcium	Mg	Na	Sulfur	Mn	Copper	Iron	Sulfate	Hardness
244	Fredericksburg	5.91	62.4	0	2.1	0.08	4.7	0	9.5	4.5	0.105	0.027	0.199	.	13.5
245	Spotsylvania	7.02	125.4	3.19	5	0	0	0	44.2	0.5	0	0	0	.	1.5
246	Fredericksburg	7.15	167.6	0.06	3.1	0.58	1.9	0	59.6	0.4	0	0	0	.	1.2
247	Spotsylvania	5.81	76.5	2.16	9.5	0.04	13.2	1.1	7.9	0.1	0.009	0.016	0	.	0.3
248	King George	7.32	201.1	0	1	0.24	0.7	0.6	61.7	10.3	0.006	0	0.251	.	30.9
249	Louisa	6.13	47.7	0	1.6	0.14	6.8	1.8	3.4	2.4	0.02	0	0.02	.	7.2
250	Stafford	6.42	509.3	4.59	140.2	0.08	0	0	158.5	0.3	0.004	0	0	.	0.9
251	Spotsylvania	7.34	181	0.04	3.4	0.11	0	0	62	2.2	0	0	0.144	.	6.6
252	Spotsylvania	6.97	167.6	0	8.7	0.06	0	0	56.5	1.5	0	0	0	.	4.5
253	Spotsylvania	6.95	167.6	0	6.5	0.06	23.9	8.8	11.5	1.4	0.188	0.01	0.593	.	4.2
254	Spotsylvania	6.87	214.5	4.89	5.5	0.04	52.2	2.9	10.7	0.1	0.03	0.094	0	.	0.3
255	Fredericksburg	7.35	134.1	0.04	1.5	0.14	22.8	5.1	11.4	1.5	0	0.018	0	.	4.5
256	Spotsylvania	6.22	79.2	0.01	1.5	0.2	0	0	26.9	3.1	0	0	0.033	.	9.3
257	Fredericksburg	7.19	124.7	0	1.7	0.3	21.9	3.1	14.1	3.1	0.041	0	0.046	.	9.3
258	Spotsylvania	5.97	56.4	3.11	4.3	0.2	5.9	2.1	6.4	0.2	0.006	0	0	.	0.6
259	Spotsylvania	5.2	58.4	5.39	6.9	0.11	2.5	0.6	11.6	0.1	0.026	0.345	0.048	.	0.3
260	Fredericksburg	6.84	120.1	0.03	1.5	0.16	20	3.4	12.8	1.7	0.035	0.111	0	.	5.1
261	Orange	6.54	87.2	0	1.4	0.1	9.4	3.8	12.2	0.7	0	0.015	0	.	2.1
262	Fredericksburg	7.4	221.2	0.14	2.4	2.23	4.3	7.9	56	7.9	0.046	0.018	0.015	.	23.7
263	Spotsylvania	6.47	122.1	0.55	2.3	0.15	0	0.1	42.6	0.6	0.004	0	0	.	1.8
264	Fredericksburg	6.99	288.2	0.01	23.6	0.08	38	14.3	25	3.8	0.074	0.013	0.039	.	11.4
265	Spotsylvania	5.32	55.7	3.3	6.5	0	6.4	1.9	5.4	0.1	0.007	0.023	0	.	0.3
266	Spotsylvania	5.27	61.1	1.92	9.9	0.11	6.7	2.5	4.7	0.3	0.004	0	0	.	0.9
267	Fredericksburg	6.24	82.5	0	4.4	0.08	0	0	27.3	3.4	0	0	0.027	.	10.2
268	Fredericksburg	7.41	134.1	0	5.1	0.1	0.1	0.1	45.2	4.5	0.007	0	0.075	.	13.5
269	Spotsylvania	6.81	134.1	0	1.5	0.16	0	0	45.7	5.2	0	0	0	.	15.6
270	Louisa	7.14	214.5	0	2.3	0.1	0	0	73.2	4	0	0	0.048	.	12
271	Spotsylvania	7.39	154.2	0	1.9	0.15	25.2	6.3	10.1	1.1	0.072	0	0.066	.	3.3
272	Fredericksburg	5.28	24.2	0.37	2.3	0	3.9	0.4	1.7	0.3	0.006	0	0	.	0.9
273	Spotsylvania	6.29	93.3	0.19	2.4	0.15	7.4	6.5	10.7	0.3	0.356	0	0.032	.	0.9
274	Stafford	6.51	117.4	0	3.1	0.04	19.4	8.2	5.3	0.3	0.007	0.042	0	.	0.9
275	Fredericksburg	7.33	160.9	0	2.6	0.21	0	0	55.4	2.3	0.002	0	0.028	.	6.9
276	Fredericksburg	6.24	12.2	0	0.2	0.04	0	0	3.7	0	0	0	0	.	0
277	Fredericksburg	6.67	127.4	0	7.4	0.08	0	0	41.2	2.6	0	0	0	.	7.8
278	Spotsylvania	5.98	79.2	0.25	4.2	0.08	10.2	3	8.4	2.4	0.011	0	0.1	.	7.2
279	Spotsylvania	6.5	134.1	0.25	4.2	0.08	0	0	45.2	2.4	0	0	0	.	7.2

Sample#	County	pH	TDS	NO3N	Cl-	Flouride	Calcium	Mg	Na	Sulfur	Mn	Copper	Iron	Sulfate	Hardness
280	Spotsylvania	6.13	93.2	0.77	6.2	0.12	12.1	5.9	7.9	1.3	0.005	0.027	0.142	.	3.9
281	Fredericksburg	5.28	20.9	0	2.6	0.06	2.4	0.6	1.7	0.1	0.004	0.067	0	.	0.3
282	Stafford	6.99	105.3	0	1.4	0	0.2	0	36	0.4	0	0.019	0.271	.	1.2
283	Spotsylvania	6.09	61.1	2.71	3.1	0.17	6.1	2.3	6.5	0.3	0	0	0	.	0.9
284	Spotsylvania	6.84	124.1	0	3.4	0.11	0	0	41.9	2.5	0	0	0.013	.	7.5
285	Spotsylvania	7.93	181	0	1.7	0.1	2.9	0.1	39.5	0.5	0.005	0.01	0.014	.	1.5
286	Stafford	5.37	35	0.16	5.2	0	3.5	0.4	4.2	2.7	0.013	0	0.09	.	8.1
287	Stafford	5.51	94.6	3.87	20.4	0.04	14.3	2.6	5.8	0.2	0.041	0	0.01	.	0.6
288	Fredericksburg	7.23	181	0	28.9	0.22	0	0	60.5	2.5	0	0	0.105	.	7.5
289	Spotsylvania	6.78	116	2.59	2.9	0.15	20.3	6.3	7.1	2.2	0.011	0.023	0.01	.	6.6
290	Fredericksburg	6.54	112.7	0.33	5.9	0	0	0	41.5	0.3	0	0	0	.	0.9
291	Fredericksburg	6.53	56.4	0	1.4	0.07	4.1	3.8	9.1	0.2	0.019	0.045	0.222	.	0.6
292	Stafford	5.9	55.1	2.55	7.5	0	8.6	1.1	3.7	0.9	0.009	0	0.01	.	2.7
293	Fredericksburg	6.94	124.1	0	2.1	0.27	0	0	45.9	3	0	0	0.059	.	9
294	Stafford	7.17	207.8	0	3.2	0.07	23.7	5.2	42	0.9	0.065	0.034	0.041	.	2.7
295	Fredericksburg	5.97	37	2.38	2.4	0.03	4.5	1.5	2.8	0.5	0.007	0	0	.	1.5
296	Fredericksburg	7.3	181	0.71	2.1	0	57.6	3.2	2.5	0.2	0.015	0	0	.	0.6
297	Fredericksburg	6.37	227.9	0.18	41.9	0.07	38.2	12.4	13.9	0.5	0	0.035	0	.	1.5
298	Fredericksburg	6.38	117.4	8.01	5.1	0.05	25.3	2.3	4	3.9	0.014	0.157	1.918	.	11.7
299	Fredericksburg	6.37	71.1	0	1.4	0.15	9.8	1.7	7.2	2.9	0.077	0	0.969	.	8.7
300	Louisa	8.02	114	0	1.8	0.08	21.2	5.8	7.3	4.5	0.071	0	0.09	.	13.5
301	Fredericksburg	5.58	45.7	0.23	8.6	0	6.4	1.3	3.9	0.3	0.025	0.032	0.264	.	0.9
302	Fredericksburg	6.82	254.7	1	23	0.06	65.1	5.3	12.6	1.7	0.007	0.035	0	.	5.1
303	Spotsylvania	6.02	73.8	0	1.4	0.06	9.2	4.7	6.4	1.3	0.043	0	0.051	.	3.9
304	Fredericksburg	7.99	194.4	0.39	3.7	0.2	0	0	71.3	2.2	0	0	0	.	6.6
305	Fredericksburg	6.13	110	1.35	21.6	0	0	0	35.8	0.2	0	0.062	0.059	.	0.6
306	Spotsylvania	5.59	20.9	0.08	1.5	0	3.3	0.5	1.1	0.2	0.007	0.145	0.066	.	0.6
307	Stafford	5.72	35.6	2.22	2.3	0.03	4.9	1.4	3.1	0.1	0.023	0.028	0	.	0.3
308	Stafford	5.36	34.3	2.23	2.3	0.03	5	1.4	3	0.1	0.018	0.02	0	.	0.3
309	Stafford	5.53	43.7	1.16	2.4	0.14	4.5	2.4	5.3	0.1	0.008	0.143	0	.	0.3
310	Stafford	5.3	69.1	0.31	5.6	0.05	13.2	2	4.1	5.2	0.042	0.125	0.224	.	15.6
311	Fredericksburg	6.02	73.8	0	1.4	0.08	19.1	0.9	5.1	0.1	0.012	0.045	0	.	0.3
312	Fredericksburg	7.01	113.3	0	1.4	0.15	0	0	42.4	2.5	0	0	0.017	.	7.5
313	Spotsylvania	6.49	160.9	0	1.9	0.13	29.1	9.2	10.4	4.1	0.281	0.046	0.075	.	12.3
314	Spotsylvania	5.76	221.2	0	56.2	0.15	0.1	0.1	72.7	4.7	0.006	0.016	0	.	14.1
315	Fredericksburg	6.34	99.3	0.51	2	0.06	12.4	7.6	7.3	0.4	0	0.023	0	.	1.2

Sample#	County	pH	TDS	NO3N	Cl-	Flouride	Calcium	Mg	Na	Sulfur	Mn	Copper	Iron	Sulfate	Hardness
316	Caroline	5.93	63.1	1.09	14.9	0.05	7	1.1	9.5	0.4	0.002	0	0.012	.	1.2
317	Fredericksburg	5.09	89.9	0.13	35	0	5	0.9	19.8	0.2	0.032	0.042	0	.	0.6
318	Stafford	6.13	117.4	0	1.7	0.06	0	0	41.1	6.7	0	0	0.016	.	20.1
319	Fredericksburg	6.16	268.1	0.92	28.1	0.13	0.1	0	97	1.9	0.002	0.599	0.441	.	5.7
320	Fredericksburg	5.35	81.2	0.35	6	0.07	18.5	1.9	2.8	4.1	0.041	0.233	0	.	12.3
321	Westmorela.	5.33	74.5	0.04	3.3	0.03	18.8	0.6	2.8	5.7	0.02	0.104	0.035	.	17.1
322	Fredericksburg	4.98	39	0.13	8	0	5	0.5	3.8	1.3	0.012	0.114	0.051	.	3.9
323	Spotsylvania	6.01	108	2.73	2.6	0.05	8.7	3.6	7	0.7	0.003	0.044	0	.	2.1
324	Spotsylvania	5.07	108.6	0	2	0.09	0	0	40	1	0	0	0	.	3
325	Fredericksburg	5.01	28.2	0.99	2.4	0.04	2.9	1.1	3.2	0.2	0.007	0.016	0	.	0.6
326	Fredericksburg	4.73	8.8	0.18	0.4	0	0.1	0.1	0.8	0	0	0	0	.	0
327	Fredericksburg	4.86	30.9	1.28	2.6	0	5.9	0.6	2.1	0.3	0.005	0.012	0	.	0.9
328	Spotsylvania	6.12	91.2	0	1.9	0.08	0	0	35.3	2.6	0	0	0.034	.	7.8
329	Stafford	7.12	227.9	0	3.9	0.08	1.5	0.9	72.9	14.2	0.008	0	0.026	.	42.6
330	Stafford	5.85	117.4	1.54	15.8	0.04	24	2.3	5.6	3.9	0.015	0.092	0.205	.	11.7
331	Stafford	5.09	28.3	0.46	5.1	0.02	1.6	0.4	2.8	0.2	0.017	0.005	0.02	.	0.6
332	Spotsylvania	6.22	134.1	0	7.6	0.1	23.1	9.5	9.7	3.4	0	0	0	.	10.2
333	Fredericksburg	6.38	122	0	2	0.09	21.5	4.2	11.4	2.2	0.212	0	3.76	.	6.6
334	Fredericksburg	7.03	181	0	2	0.1	0	0	68.5	2.3	0	0	0	.	6.9
335	Stafford	6.56	116	0.04	3.2	0.04	21	9.1	5.7	0.3	0	0.115	0	.	0.9
336	Spotsylvania	6.2	147.5	7.89	9.3	0.03	28	5.2	11.1	0.2	0.006	0.009	0.012	.	0.6
337	Spotsylvania	6.25	116	3.23	5.3	0.04	22.1	4.2	10.3	0.5	0.034	0.214	0.039	.	1.5
338	Fredericksburg	6.61	130.8	0.06	1.8	0.03	3.4	0.9	45.2	0.3	0.005	0.1	0.136	.	0.9
339	Fredericksburg	7.12	117.4	1.37	11.1	0.03	0	0	40.2	4.1	0	0	0	.	12.3
340	Fredericksburg	5.89	95.9	0.88	7.5	0.03	17.1	3.4	6.1	0.8	0	0.04	0	.	2.4
341	Fredericksburg	6.37	181	2.27	19.7	0	40.5	9.8	11.8	2	0	0.083	0	.	6
342	Fredericksburg	5.67	31.6	0.02	1.8	0	6.4	0.5	2.3	0.1	0.007	0.081	0	.	0.3
343	Stafford	6.97	241.3	1.67	23.2	0.03	50.1	12.5	17.9	0.5	0	0.084	0	.	1.5
344	Fredericksburg	6.91	89.9	0	2.4	0.09	0	0	34.7	3.6	0	0.047	0.533	.	10.8
345	Fredericksburg	6.18	75.2	0	2.2	0.16	7.2	3.2	6.9	3.5	0.158	0.014	4.496	.	10.5
346	Fredericksburg	6.61	95.9	0	2	0.1	0	0	32.6	4.1	0	0	0.008	.	12.3
347	Fredericksburg	5.62	25.6	0.02	1.3	0.04	1.9	0.8	3.5	0.4	0	0	0	.	1.2
348	Fredericksburg	4.85	80.5	0.13	24.2	0.03	3.3	2	13.6	3.5	0.025	0.049	0.054	.	10.5
349	Fredericksburg	6.48	181	0.09	20.9	0.06	0.1	0	65.8	2.6	0	0	0	.	7.8
350	Fredericksburg	6.48	107.3	0.42	2.3	0.02	0	0	41	0.3	0	0	0.122	.	0.9
351	Fredericksburg	6.09	45.7	0.2	1.2	0.04	5.6	1.6	7.6	0.1	0	0.02	0	.	0.3

Sample#	County	pH	TDS	NO3N	Cl-	Flouride	Calcium	Mg	Na	Sulfur	Mn	Copper	Iron	Sulfate	Hardness
352	Orange	6.42	68.5	0	1.2	0.03	18.5	1.3	2.4	0.2	0.011	0.087	0	.	0.6
353	Spotsylvania	5.54	101.3	2	18.2	0.03	11.2	1.5	17.5	0.3	0.07	0.081	0.03	.	0.9
354	Fredericksburg	6.19	51	0	1.5	0.07	0	0	17.2	2.7	0	0	0	.	8.1
355	Fredericksburg	6.78	194.4	0	2.9	0.05	41.4	8.3	15.8	1.8	0.01	0.063	0	.	5.4
356	Fredericksburg	5.27	47	2.89	5.5	0.02	4.4	1.6	4.4	0.3	0.013	0.018	0	.	0.9
357	Fredericksburg	7.06	44.3	0	1.3	0.11	0	0	52.9	3.9	0	0	0.02	.	11.7
358	Fredericksburg	6.49	181	7.43	1.7	0.05	31.2	3.2	17.6	3.8	0.008	1.426	0.66	.	11.4
359	Fredericksburg	6.9	185	8.01	1.8	0.07	31.4	3.1	15.7	3.8	0.003	0.209	0.744	.	11.4
360	Fredericksburg	6.1	59.7	0	1.7	0.19	3.7	1.9	8.1	2	0.22	0	0.595	.	6
361	Fredericksburg	6.33	120	0.04	1.8	0.11	24.6	2.2	8.5	2	0.266	0	0.179	.	6
362	Spotsylvania	8.12	134.1	0.02	14.9	0.62	19.8	1.6	20.3	17.1	0	0	0.009	.	51.3
363	Spotsylvania	7.06	134.1	0.05	17.3	0.61	21.2	2.1	20.2	17.4	0.003	0	0	.	52.2
364	Spotsylvania	6.91	147.5	0.05	15.4	0.44	18.5	1.8	19.5	17	0.002	0	0	.	51
365	Spotsylvania	6.92	147.5	0.2	16.2	0.53	18.7	1.6	19.5	17.1	0	0	0.009	.	51.3
366	Spotsylvania	5.42	24.2	0.03	2.1	0.08	4.2	0.4	1.5	0.3	0.038	0	0.035	.	0.9
367	Stafford	6.28	160.9	1.15	7.9	0.04	0.3	0	55.2	6.8	0	0	0.009	.	20.4
368	Fredericksburg	5.61	214.5	1.63	78.9	0.11	16.7	3.1	36.8	2.5	0.043	0	0.009	.	7.5
369	Fredericksburg	5.63	214.5	1.17	78.8	0.09	16.8	3.2	37.2	2.5	0.042	0.005	0	.	7.5
370	Louisa	6.38	63.1	0.14	2.2	0	0	0	23.6	0.1	0	0.005	0	.	0.3
371	Spotsylvania	6.59	63.1	0.07	1.5	0.08	9.2	3.4	5.7	0.8	0.012	0.072	0	.	2.4
372	Spotsylvania	5.89	99.3	6.72	10.4	0.04	13.9	2.8	10.5	0.1	0	0.019	0	.	0.3
373	Stafford	6.6	100.6	0.09	1.6	0.07	17.7	5.3	8.5	0.7	0	0.016	0	.	2.1
374	Spotsylvania	6.33	49	0	0	0	9.3	1	4.2	0.6	0	0.225	0	.	1.8
375	Spotsylvania	5.58	45	0.03	2.4	0.08	8	1.3	3.6	0.1	0.003	0.153	0	.	0.3
376	Fredericksburg	5.36	43.7	1.81	4.9	0.09	6.3	0.6	4.5	0.8	0.014	0.042	0.495	.	2.4
377	King George	7.59	181	0	0.8	0.73	0.1	0.1	64.3	6	0	0.027	0.036	.	18
378	Spotsylvania	6.74	147.5	0.03	1.5	0.14	0.2	0.1	53.7	2.1	0	0	0.012	.	6.3
379	Spotsylvania	6.71	194.4	0.51	11.6	0.1	0.1	0	71.8	0.2	0.006	0	0.014	.	0.6
380	Spotsylvania	6.13	85.9	1.13	3.5	0.1	22.4	1	3.6	2.6	0.006	0.098	0.268	.	7.8
381	Fredericksburg	5.83	53	0.35	1.7	0.18	6.9	1.5	7.3	0.1	0	0	0	.	0.3
382	Fredericksburg	6.01	51	0.01	1.6	0.09	14	1.4	1.2	0.3	0.008	0.137	0	.	0.9
383	Fredericksburg	6.21	10.2	0	0.3	0	0	0	2.8	0	0	0	0	.	0
384	Stafford	6.35	207.8	0.37	9.8	0.09	33.6	16	9.7	3.3	0	0.161	0	.	9.9
385	Spotsylvania	6.88	119.4	0	2.4	0.17	0	0	42.2	3.9	0	0.006	0.033	.	11.7
386	Spotsylvania	6.02	48.3	0	1.5	0.09	1.4	2.6	2.7	3.7	0.193	0.016	1.273	.	11.1
387	Spotsylvania	7.02	130.8	0	2.1	0.15	22.8	5.8	10.9	0.6	0.092	0.018	0.108	.	1.8

Sample#	County	pH	TDS	NO3N	Cl-	Flouride	Calcium	Mg	Na	Sulfur	Mn	Copper	Iron	Sulfate	Hardness
388	Spotsylvania	7.01	167.6	0	2.1	0.15	11.5	7.2	30.6	1.8	0.523	0.011	0.75	.	5.4
389	Spotsylvania	6.47	147.5	0.07	21.4	0.14	7.9	6.8	24.8	2.2	0.163	0	0.186	.	6.6
390	Spotsylvania	7.01	241.3	0	0	0	0	0.1	87.4	2.1	0	0	0.033	.	6.3
391	Spotsylvania	7.85	301.6	0	0	0	8.4	4.7	79.6	9.2	0.121	0	0.091	.	27.6
392	Spotsylvania	7.33	268.1	0	22.1	0.23	0	0	91.9	7.5	0.007	0	0.061	.	22.5
393	Spotsylvania	6.54	118	0	2.3	0.08	16.8	7.5	8	1.8	0.127	0	0.847	.	5.4
394	Spotsylvania	7.1	268.1	0	9.1	0.12	0.2	0.1	92.3	1.7	0	0	0	.	5.1
395	Spotsylvania	7.88	181	0.45	1.9	0.1	0	0	62.2	0.6	0	0.007	0.028	.	1.8
396	Spotsylvania	5.71	55.7	2.36	7.3	0.09	4.4	2.1	8.6	0.3	0.009	0	0	.	0.9
397	Spotsylvania	6.92	81.2	0.03	1.8	0.2	9.1	4.2	7.9	2.7	0.11	0	0.868	.	8.1
398	Fredericksburg	5.9	43.7	0.04	2.4	0.03	3.5	2.3	6.3	0.2	0.011	0.036	0	.	0.6
399	Fredericksburg	5.32	35.6	1.53	5	0	2.8	1.1	3.4	0.7	0.011	0.073	0.236	.	2.1
400	Fredericksburg	7.78	207.8	0	1.7	0.13	0	0	75.2	1	0	0	0	.	3
401	Fredericksburg	6.44	73.1	0	1.4	0	21.6	1	1.1	0.2	0.012	0.087	0	.	0.6
402	Spotsylvania	5.68	52.4	0.22	2	0.1	8.3	0.9	6.6	0.3	0.005	0.083	0	.	0.9
403	Spotsylvania	6.99	294.9	0	53.2	0.07	0	0	97.9	2.5	0	0	0.018	.	7.5
405	Fredericksburg	5.52	38.3	1.72	4.5	0.11	4.5	0.7	3.7	0.9	0.026	0.039	0.235	.	2.7
406	Spotsylvania	6.56	160.9	0.23	3.3	0.14	20.3	7.5	16	3.1	0.003	0	0	.	9.3
407	Stafford	7.29	112	0.38	1.7	0.05	0	0	39.3	0.3	0	0	0	.	0.9
408	Spotsylvania	6.78	128.7	0.06	1.2	0.04	0	0	46.7	0.5	0	0	0	.	1.5
409	Fredericksburg	6.08	51	0.4	1.9	0.11	7.3	1.9	5.8	0.3	0.009	0	0	.	0.9
410	Spotsylvania	7.2	93.9	0.05	1.5	0.1	14.4	3.9	7.8	2.8	0.324	0	0.12	.	8.4
411	Spotsylvania	7.22	174.3	0	15.7	0.07	0	0	58.4	3.8	0.003	0	0	.	11.4
412	Fredericksburg	5.72	37	0.83	2.7	0.04	6	0.6	2.5	0.5	0.018	0.011	0.01	.	1.5
413	Spotsylvania	6.3	119.4	2.57	10.8	0.11	22.7	1.8	8.4	3.1	0.008	0.042	0.024	.	9.3
414	Caroline	6.01	221.2	0	19.2	0.15	32.9	11.8	11.1	1.9	0.014	0.02	0	.	5.7
415	Fredericksburg	5.76	45.7	0.27	2.1	0.05	4.9	1.6	6.8	0.3	0	0.015	0	.	0.9
416	Stafford	7.26	132.8	0	2	0.09	0	0	45.7	3.4	0	0	0	.	10.2
417	Spotsylvania	5.62	56.4	1.96	6.2	0.11	4.3	2.1	8.4	0.3	0.007	0	0	.	0.9
418	Stafford	7.24	221.2	0	2.2	0.15	0	0	72.8	14.6	0	0	0	.	43.8
419	Fredericksburg	5.45	167.6	0.75	60.7	0.1	4.4	1.3	38.9	2.5	0.015	0.037	0.206	.	7.5
420	Spotsylvania	5.95	52.4	0.02	1.3	0.12	5	2.3	6.1	0.2	0.004	0	0.025	.	0.6
421	Stafford	4.95	66.4	0.37	14.3	0.11	7	1.9	5.6	3	0.029	0.117	0	.	9
422	Spotsylvania	6.36	83.9	0	1.4	0.11	7	5.6	5	3.3	0.201	0.014	3.075	.	9.9
423	Louisa	6.48	65.8	0	1.3	0.05	7.7	3.6	7.3	0.8	0	0.006	0	.	2.4
424	Spotsylvania	5.6	25.6	0.02	1.2	0.06	1.8	1.7	1.8	1.2	0.006	0	0	.	3.6

Sample#	County	pH	TDS	NO3N	Cl-	Flouride	Calcium	Mg	Na	Sulfur	Mn	Copper	Iron	Sulfate	Hardness
425	Fredericksburg	4.74	55	0.12	12.1	0.14	4.7	1.3	5	3.9	0.035	0.11	0.042	.	11.7
426	Stafford	6.8	160.9	0	2.6	0.07	31.1	9	3.9	6.1	0.079	0	0.189	.	18.3
427	Fredericksburg	5.74	37	0	1.5	0.1	3.5	0.8	6.5	0.2	0.005	0.011	0	.	0.6
428	Spotsylvania	6.91	104.6	0	1.2	0.1	16.7	3.9	9.6	2.7	0.057	0.008	0.036	.	8.1
429	Fredericksburg	6.92	194.4	0.63	2	0.03	4.9	1.2	57.7	0.5	0.007	0.026	0	.	1.5
430	Fredericksburg	7.63	194.4	0	2.3	0.11	40.7	8.6	9.2	1	0	0.017	0	.	3
431	Spotsylvania	7.4	194.4	0	5.1	0.09	0	0	64.9	3	0	0	0.089	.	9
432	Spotsylvania	6.58	109.3	0	4.8	0.09	11.6	6.6	10.7	3	0.342	0	0.597	.	9
433	Spotsylvania	5.3	19.5	0.08	1.3	0.11	2.3	0.5	1.2	0.1	0.025	0.193	0	.	0.3
434	Spotsylvania	6.19	51	1.32	2.2	0.04	6.7	0.9	7.2	0.7	0.004	0.115	0.271	.	2.1
435	Fredericksburg	5.36	34.3	0.08	2.8	0.11	4.8	0.5	3	2.2	0.013	0.037	0.029	.	6.6
436	Spotsylvania	5.81	51	2.55	3.7	0.04	4.2	2.4	6.8	0.2	0.006	0	0	.	0.6
437	Fredericksburg	7.74	118	0.05	1	1	2.2	2	31.7	4.1	0.012	0	0.264	.	12.3
438	Spotsylvania	8.07	241.3	0.2	6.1	0.04	0	0	82.4	0.7	0	0	0	.	2.1
439	Spotsylvania	6.85	160.9	0	2.2	0.08	0	0	58.6	0.3	0	0	0.072	.	0.9
440	Louisa	5.89	79.8	3.12	6	0.06	10	1.8	9.6	0.2	0	0	0	.	0.6
441	Spotsylvania	6.38	85.2	0	0	0	9.8	5.5	8.8	0.4	0.041	0.007	0.064	.	1.2
442	Spotsylvania	6.09	62.4	0.35	2.3	0.03	0	0	21.9	0.3	0	0	0	.	0.9
443	Spotsylvania	5.69	28.2	0	0	0	5	0.7	1.2	0.3	0.007	0	0	.	0.9
444	Fredericksburg	5.65	132.1	3.72	18.3	0.02	15.8	5	11.8	5.1	0.004	0.015	0	.	15.3
445	Fredericksburg	7.59	207.8	0	20	0.29	0	0	68.3	4.1	0	0	0.009	.	12.3
446	Fredericksburg	5.01	80.5	6.13	9	0.14	4.9	4.2	7.6	1.2	0.01	0	0.011	.	3.6
447	Fredericksburg	6.56	281.5	0.14	10.6	0.03	0	0	100.5	0.1	0	0.029	0	.	0.3
448	Fredericksburg	7.17	268.1	1.91	16.9	0.06	0	0	94	0.2	0	0	0	.	0.6
449	Fredericksburg	6.97	268.1	4.37	21.7	0.03	66.3	2.4	15.6	0.1	0.053	0.029	0	.	0.3
450	Stafford	7.52	207.8	0	5.6	0.13	1.3	0.1	70.3	7.7	0	0	0	.	23.1
451	Stafford	6.33	294.9	4.53	51.5	0.04	0.1	0	90.4	5	0	0	0	.	15
452	Spotsylvania	7.03	122.7	0.02	2.6	0.09	9.3	3.4	24.4	3.4	0	0.013	0	.	10.2
453	Caroline	7.71	119.4	0.04	1.2	0.17	0	0	41	2.9	0	0	0.029	.	8.7
454	Louisa	6.15	49	0	1.4	0.06	5	1.8	6.6	0.3	0.036	0.067	0.008	.	0.9
455	Spotsylvania	7.2	124	0	2.4	0.09	9.4	3.7	24.2	3.4	0.032	0.021	0.009	.	10.2
456	Fredericksburg	7.46	234.6	0	24.7	0.18	37.6	16.9	9.4	2.4	0.114	0	0.041	.	7.2
457	Spotsylvania	6.19	77.8	1.54	1.6	0.11	10.7	3.2	6.8	0.2	0.007	0.006	0	.	0.6
458	Fredericksburg	6.97	147.5	0.95	6.6	0.09	23.7	8	8.2	0.2	0	0	0	.	0.6
459	Spotsylvania	5.74	25.6	0.04	1.5	0.04	4.4	0.6	1.4	0.3	0.005	0	0.073	.	0.9
460	Louisa	7.25	121.4	0.14	1.5	0.17	19.6	9.1	5.9	1.6	0	0.02	0	.	4.8

Sample#	County	pH	TDS	NO3N	Cl-	Flouride	Calcium	Mg	Na	Sulfur	Mn	Copper	Iron	Sulfate	Hardness
461	Fredericksburg	7.09	160.9	3.22	14.2	0	7.4	1.8	39.7	2	0.019	0.06	0.06	.	6
462	Fredericksburg	7.96	2345.1	0	821	0.92	50.6	6.2	567.9	80.4	0.005	0.018	0.024	.	241.2
463	Spotsylvania	6.61	122.7	0.05	1.6	0.04	17	7.1	12.5	0.1	0	0.004	0	.	0.3
464	Louisa	6.33	80.5	0.16	3.1	0.07	13.2	2.5	7.9	0.2	0	0.019	0	.	0.6
465	Fredericksburg	6.47	147.5	0	2.6	0.1	0	0	44.9	12.2	0	0	0.025	.	36.6
466	Fredericksburg	5.79	281.5	0.46	103.7	0.11	21	5.6	43.8	0.3	0.059	0	0.01	.	0.9
467	Louisa	7.16	118	0	1.3	0.24	0	0	41.7	2.3	0	0	0.399	.	6.9
468	Spotsylvania	5.94	30.9	0	1.4	0.05	1.1	0.9	7.1	0.2	0	0.022	0	.	0.6
469	Fredericksburg	6.85	234.6	0.21	1.3	0.1	79.2	0.9	2.3	0.2	0.032	0.082	0	.	0.6
470	Spotsylvania	6.7	65.7	0.25	1.3	0.06	0.2	0.1	23.4	0.6	0	0	0.188	.	1.8
471	Spotsylvania	5.97	24.9	0.02	1.1	0.04	3.6	0.8	2.4	0.2	0.004	0.087	0	.	0.6
472	Stafford	7.02	221.2	0.27	6.3	0.13	45.7	14.8	10	0.4	0.012	0.102	0.305	.	1.2
473	Stafford	6.41	254.7	2.42	34.8	0	0.4	0.1	84.1	0.6	0	0.017	0	.	1.8
474	Spotsylvania	6.5	87.9	0.02	1.2	0.05	17.2	3.6	6.6	0.1	0.041	0.064	0.012	.	0.3
475	Fredericksburg	5.5	43	1.56	6.9	0.04	5.1	1.5	3.5	0.2	0.004	0.066	0.019	.	0.6
476	Stafford	7.09	174.3	0	2	0.1	0	0	61.7	8	0	0	0.027	.	24
477	Fredericksburg	7.26	134.1	0	1.3	0.09	0	0	44.6	4.4	0	0	0.119	.	13.2
478	Fredericksburg	5.93	34.3	0.55	2.2	0.05	4.7	1	2.4	1	0.038	0	0.034	.	3
479	Spotsylvania	5.8	22.2	0	0	0	4.2	0.4	1.3	0.2	0.01	0.023	0	.	0.6
480	Spotsylvania	6.45	65.1	0	1.3	0.09	4	4.6	9.4	0.3	0.02	0.007	0	.	0.9
481	Stafford	5.84	21.5	0	0.1	0	0	0	6.4	0.1	0	0	0	.	0.3
482	King George	6.09	95.9	0	4	0.04	18	4.2	3.8	4.3	0.088	0.005	0.092	.	12.9
483	King George	7.44	194.4	0.05	0.8	0.25	0.6	0.5	62.3	9.3	0.005	0.006	0.067	.	27.9
484	Stafford	6.39	65.1	1.96	4.8	0	11.7	3	2.7	0.2	0	0.005	0	.	0.6
485	Fredericksburg	7.41	134.1	0.03	1.5	0	45.8	1.1	1.4	0.3	0.005	0.013	0	.	0.9
486	Fredericksburg	7.18	227.9	0	2.2	0.05	0.4	0.1	78.4	0.9	0	0	0.081	.	2.7
487	Fredericksburg	5.95	68.4	4.88	3	0.04	12.6	1.8	2.1	1.3	0.03	0.027	0.316	.	3.9
488	Fredericksburg	6.47	74.5	0	1.2	0.53	12.8	1.6	8.6	1	0.004	0	0	.	3
489	Fredericksburg	6.64	101.9	0.1	3.9	0.05	0	0	35.1	0.1	0	0	0	.	0.3
490	Louisa	5.97	32.3	0	1.7	0.03	4.6	1.4	2.7	0.1	0	0.01	0	.	0.3
491	Fredericksburg	7.49	234.6	0.02	9.9	0.05	55.4	8.6	8.8	4.4	0.014	0.029	0	.	13.2
492	Caroline	6.74	174.3	3.34	14.8	0.03	11.4	18	13.8	1.6	0.041	0.009	0.056	.	4.8
493	Spotsylvania	7.86	147.5	0.03	3.3	0.12	0	0	53.9	3.7	0	0	0.008	.	11.1
494	Fauquier	6.85	132.8	0.04	2.6	0	39.5	1	3.4	0.2	0.033	0.106	0	.	0.6
495	Spotsylvania	6.72	87.9	0	3	0.11	0	0	29.7	5.5	0	0	0	.	16.5
496	Spotsylvania	6.35	59.7	0	5.2	0.09	0	0.1	17.8	2.5	0	0	0.019	.	7.5

Sample#	County	pH	TDS	NO3N	Cl-	Flouride	Calcium	Mg	Na	Sulfur	Mn	Copper	Iron	Sulfate	Hardness
497	Louisa	6.76	118	0	1.5	0.13	20.5	4.6	9.9	1.5	0.424	0	0.428	.	4.5
498	Spotsylvania	7.42	97.9	0.06	1.2	0.13	0	0	34.7	1.2	0.004	0	0	.	3.6
499	Spotsylvania	6.5	125.4	0	5.7	0.09	15.2	9.8	8.6	0.2	0.008	0	0	.	0.6
500	Stafford	6.44	355.2	0	80.6	0.14	8.7	0.9	98.7	6.8	0.118	0	0.413	.	20.4
501	Stafford	5.72	46.3	0.93	3.1	0.04	5.3	1.7	2.5	2.5	0.025	0.233	2.588	.	7.5
502	Louisa	7.39	147.5	0	1.4	0.11	24	8	7.5	2.6	0.174	0	0.035	.	7.8
503	Stafford	5.41	45	0	4.5	0	4.6	0.5	3.3	4.5	0.098	0	0.2	.	13.5
504	Stafford	7.09	181	0	2.2	0.12	0	0	60.9	8.2	0	0	0.018	.	24.6
505	Caroline	5.33	119.4	6.78	20.7	0.05	7.8	3.7	14.1	3	0.273	0.047	0.022	.	9
506	Fredericksburg	7.2	181	0	2	0.21	0	0	65.7	2.2	0	0	0	.	6.6
507	Spotsylvania	6.77	147.5	0.24	2	0.08	40.3	1.1	7.7	0	0.011	0	0	.	0
508	Spotsylvania	6.27	45	0.02	1	0.05	4.8	1.6	7	0.4	0.004	0	0	.	1.2
509	Fredericksburg	7.52	93.9	0.41	2.3	0.03	0	0	32.7	0.3	0	0	0.022	.	0.9
510	Fredericksburg	6.03	45	0	1.9	0.04	6.9	2	4.2	0	0.009	0	0	.	0
511	Fredericksburg	6.06	51	1.65	2.6	0.04	9.6	1.2	1.8	1.3	0.01	0.017	0	.	3.9
512	Fredericksburg	7.2	181	0.12	1.9	0.21	0	0	65.3	0.1	0	0	0	.	0.3
513	Louisa	6.77	147.5	1.49	4.7	0.16	26.4	5.3	11.4	4.1	0.01	0.016	0	.	12.3
514	Fredericksburg	6.09	48.3	0.31	2.5	0.05	7.6	1	4.9	0.3	0.003	0.007	0.036	.	0.9
515	Louisa	7.2	301.6	0.14	7.7	0.23	70.6	9.2	10.4	24.6	0.015	0.027	0.011	.	73.8
516	Spotsylvania	6.07	68.4	1.81	3	0	0	0	22.6	0.1	0	0	0	.	0.3
517	Louisa	7.62	181	0	3.6	0.06	0	0	65	2	0	0	0.026	.	6
518	Spotsylvania	6.48	87.2	0.04	1.6	0.08	13.6	4	7.8	0.4	0.016	0.007	0	.	1.2
519	Spotsylvania	7.64	160.9	0.16	17.2	0.05	1.9	0.1	53.3	1.7	0	0	0	.	5.1
520	Louisa	6.22	49	0.56	2	0.15	4.7	3	5	1	0.005	0.064	0.014	.	3
521	Fredericksburg	6.12	46.3	0.31	2.6	0.1	0	0	15.7	0.3	0	0.047	0.038	.	0.9
522	Fredericksburg	4.07	34.3	0.02	3.2	0.04	0.9	0.9	2.5	4.1	0.044	0.231	0.207	.	12.3
523	Fredericksburg	6.92	315	0	70.2	0.46	15.3	6.7	63.9	10.4	0.058	0	1.304	.	31.2
524	Fredericksburg	5.45	28.9	0.73	2.2	0.05	2.8	0.9	3.4	0.3	0.004	0.005	0.008	.	0.9
525	Spotsylvania	5.08	19.5	0.45	1.8	0	2.2	0.6	1.4	0.2	0.082	0.011	0	.	0.6
526	Louisa	7.04	227.9	0.21	4.9	0.09	45.9	11.8	9.3	3.2	0	0	0	.	9.6
527	Stafford	6.01	112	8.18	5.9	0.04	20.2	5.7	5.1	1.7	0	0.064	0.063	.	5.1
528	Fredericksburg	6.87	122.7	0.48	2.2	0.07	5.4	1.1	36.7	0.9	0	0.006	0	.	2.7
529	Fredericksburg	6.9	85.8	0	1.5	0.17	11.1	6	6.3	1.8	0	0	0	.	5.4
530	Spotsylvania	7	147.5	0	2.5	0.11	20.4	9.1	15	1.1	0.105	0	0.15	.	3.3
531	Spotsylvania	7.29	147.5	0	3	0.2	0	0	54.6	1.2	0	0	0.041	.	3.6
532	Fredericksburg	6.98	41	0	23.5	0.04	14.9	0.2	92.5	4.5	0.009	0	0.066	.	13.5

Sample#	County	pH	TDS	NO3N	Cl-	Flouride	Calcium	Mg	Na	Sulfur	Mn	Copper	Iron	Sulfate	Hardness
533	Spotsylvania	5.98	26.9	0.22	1.6	0.04	2.7	1.2	8.6	0.2	0.007	0	0	.	0.6
534	Louisa	5.63	87.2	0	2.4	0	3.7	0.9	3.2	0.2	0.004	0	0	.	0.6
535	Fredericksburg	6.64	194.4	0.48	6.5	0.05	47.9	7.7	7.9	2.1	0	0.033	0	.	6.3
536	Louisa	7.2	88.5	3.31	11.6	0.04	5.9	1.4	15	3.4	0.01	0.154	0	.	10.2
537	Spotsylvania	6.8	102.6	0.04	2.4	0.04	0	0	37.4	0.4	0	0.01	0	.	1.2
538	Spotsylvania	5.44	12.8	0.1	1.7	0	1.1	0.4	1.3	0	0.003	0.008	0.008	.	0
539	Fredericksburg	5.67	36.9	0	1.3	0.06	3.9	1.4	3.9	3.1	0.051	0.022	0	.	9.3
540	Louisa	5.54	43.6	0.77	5	0	6	0.4	6.4	0.1	0	0.049	0	.	0.3
541	Fredericksburg	6.26	79.8	0.55	4.2	0.15	0.1	0	28	0.4	0	0	0	.	1.2
542	Spotsylvania	5.62	39	0.26	1.6	0	2.9	1.6	6.9	0.1	0.043	0.025	0	.	0.3
543	Fredericksburg	6.8	221.2	0	19.5	0.16	0	0	80.9	2.2	0	0.012	0	.	6.6
544	Spotsylvania	5.9	71.8	.	.	.	11.1	1.1	8.7	0.9	0.008	0.068	0.739	.	2.7
545	Spotsylvania	5.79	160.9	0	28.5	0.18	18.9	7.3	13.3	7.1	0.541	0.039	0.275	.	21.3
546	Fredericksburg	6.54	147.5	4.73	5.8	0.05	33.1	2.3	6	1.3	0.047	0	0	.	3.9
547	Spotsylvania	6.5	71.8	0.06	1.2	0.06	5.5	5.3	9.1	0.8	0.046	0	0.112	.	2.4
548	Spotsylvania	7.08	125.4	0	1.8	0.11	26.3	6.6	6.3	3.1	0.118	0	0.433	.	9.3
549	Fredericksburg	5.69	61.7	1.01	6.4	0.04	9.1	1.3	6.9	1	0.026	0.095	0.017	.	3
550	Spotsylvania	6.93	97.2	1.9	3	0.15	16.7	4.2	7.3	1.2	0	0.032	0	.	3.6
551	Spotsylvania	6.49	116	0.48	6.3	0.04	19.2	6.3	12.5	0.4	0	0.043	0	.	1.2
552	Spotsylvania	6.59	134.1	0	1.7	0.11	23.2	7.8	8.6	2.1	0.17	0.023	0.176	.	6.3
553	Spotsylvania	5.53	25.6	0.02	1.3	0	3.4	0.6	3.2	0.1	0.01	0.066	0	.	0.3
554	Spotsylvania	5.84	34.3	0.02	1.3	0.05	5.8	1.3	2.1	0.2	0.009	0.023	0.021	.	0.6
555	Spotsylvania	6.49	89.9	0	1.6	0.09	8	7.3	10.4	1.4	0.14	0.041	1.768	.	4.2
556	Spotsylvania	6.68	122	0	4.3	0.08	0	0	42.9	1.8	0.003	0	0.219	.	5.4
557	Spotsylvania	6.94	134.1	0.06	13.3	0.63	18	1.6	18.3	16.4	0	0	0.047	.	49.2
558	Stafford	5.73	73.8	0.34	2.4	0.11	19.9	0.7	2.9	0.9	0.021	0	0	.	2.7
559	Fredericksburg	6.88	174.3	0	6	0.09	43.3	3.3	9.8	2.2	0.082	0	0.014	.	6.6
560	Spotsylvania	5.76	34.3	1.23	2.4	0	3.8	1.1	3.1	0.1	0.007	0.014	0	.	0.3
561	Spotsylvania	5.99	75.8	0.57	21.7	0	3.2	0.3	19.6	0.3	0	0	0.044	.	0.9
562	Spotsylvania	5.73	51	0.07	2.3	0.05	4.3	1.3	10.4	0.1	0.018	0.025	0.022	.	0.3
563	Fredericksburg	5.73	79.1	0.04	2.5	0.04	16.7	3.4	2.5	0.4	0.048	0.077	0.058	.	1.2
564	Louisa	6.48	207.8	2.77	6.2	0.05	58.5	2.4	5.8	0.1	0.005	0.129	0	.	0.3
565	Fredericksburg	6.24	107.3	0	2.9	0.18	5.9	1.4	3.3	5.5	0.097	0.012	0.571	.	16.5
566	Stafford	6.8	160.9	0.1	1.6	0.09	29.4	11.8	2.2	7.1	0.072	0	0	.	21.3
569	Spotsylvania	5.34	54.3	0.4	10.1	0	8.7	1.9	3.8	0.1	0.006	0.453	0.022	.	0.3

Table B3. Raw Bacterial and Source Data

Sample#	County	TC_Bin	EC_Bin	TC_MPN	EC_MPN	Sample#	County	TC_Bin	EC_Bin	TC_MPN	EC_MPN
1	Smyth	1	0	54	0	**36**	Tazewell	1	0	8	0
2	Smyth	1	0	2	0	**37**	Tazewell	1	1	528	422
3	Smyth	0	0	0	0	**40**	Frederick	1	0	1	0
4	Smyth	0	0	0	0	**41**	Frederick	1	0	3	0
5	Smyth	1	1	36	19	**42**	Frederick	0	0	0	0
6	Smyth	1	1	191	37	**43**	Frederick	0	0	0	0
7	Smyth	0	0	0	0	**44**	Frederick	0	0	0	0
8	Smyth	1	1	238	64	**45**	Frederick	0	0	0	0
9	Smyth	1	1	65	9	**46**	Frederick	0	0	0	0
10	Smyth	0	0	0	0	**47**	Frederick	0	0	0	0
11	Smyth	1	0	39	0	**48**	Frederick	0	0	0	0
12	Smyth	0	0	0	0	**49**	Frederick	0	0	0	0
13	Smyth	1	1	39	20	**50**	Clarke	1	0	6	0
14	Smyth	0	0	0	0	**51**	Frederick	0	0	0	0
15	Smyth	1	1	793	591	**52**	Frederick	1	0	103	0
16	Smyth	0	0	0	0	**53**	Frederick	0	0	0	0
17	Smyth	1	1	87	30	**54**	Frederick	1	0	2	0
18	Smyth	1	1	128	95	**55**	Frederick	0	0	0	0
19	Smyth	0	0	0	0	**56**	Clarke	0	0	0	0
20	Smyth	0	0	0	0	**57**	Frederick	0	0	0	0
21	Smyth	1	1	38	4	**58**	Frederick	0	0	0	0
22	Smyth	0	0	0	0	**59**	Clarke	1	0	4	0
23	Russell	1	0	2	0	**60**	Clarke	0	0	0	0
24	Russell	0	0	0	0	**61**	Frederick	0	0	0	0
25	Russell	1	0	6	0	**62**	Frederick	0	0	0	0
26	Russell	1	0	2	0	**63**	Frederick	0	0	0	0
27	Tazewell	0	0	0	0	**64**	Frederick	0	0	0	0
28	Tazewell	1	0	25	0	**65**	Clarke	0	0	0	0
29	Russell	0	0	0	0	**66**	Frederick	0	0	0	0
30	Tazewell	1	1	1337	1216	**67**	Clarke	0	0	0	0
31	Tazewell	0	0	0	0	**68**	Clarke	0	0	0	0
32	Tazewell	1	0	1	0	**69**	Clarke	0	0	0	0
33	Tazewell	1	1	74	20	**70**	Clarke	0	0	0	0
34	Tazewell	0	0	0	0	**71**	Clarke	0	0	0	0
35	Tazewell	1	1	17	2	**72**	Clarke	0	0	0	0

Sample#	**County**	**TC_Bin**	**EC_Bin**	**TC_MPN**	**EC_MPN**	**Sample#**	**County**	**TC_Bin**	**EC_Bin**	**TC_MPN**	**EC_MPN**
73	Clarke	0	0	0	0	**110**	Lee	1	0	1	0
74	Clarke	0	0	0	0	**111**	Loudoun	1	0	0	0
75	Frederick	0	0	0	0	**112**	Loudoun	1	1	5136	793
76	Frederick	0	0	0	0	**113**	Loudoun	1	0	11	0
77	Frederick	0	0	0	0	**114**	Loudoun	0	0	0	0
78	Frederick	0	0	0	0	**115**	Loudoun	0	0	0	0
79	Frederick	1	0	1	0	**116**	Loudoun	1	0	1	0
80	Frederick	1	0	447	0	**117**	Loudoun	1	0	4	0
81	Frederick	0	0	0	0	**118**	Loudoun	0	0	0	0
82	Frederick	0	0	0	0	**119**	Loudoun	0	0	0	0
83	Clarke	0	0	0	0	**120**	Loudoun	0	0	0	0
84	Frederick	0	0	0	0	**121**	Loudoun	0	0	0	0
85	Frederick	0	0	0	0	**122**	Loudoun	1	0	10	0
86	Clarke	0	0	0	0	**123**	Loudoun	1	0	1	0
87	Clarke	0	0	0	0	**124**	Loudoun	1	1	34	1
88	Clarke	0	0	0	0	**125**	Loudoun	0	0	0	0
89	Frederick	1	1	4	1	**126**	Loudoun	0	0	0	0
90	Frederick	0	0	0	0	**127**	Loudoun	1	0	339	0
92	Scott	1	0	38	0	**128**	Loudoun	0	0	0	0
93	Scott	1	0	10	0	**129**	Loudoun	1	0	3	0
94	Scott	0	0	0	0	**130**	Loudoun	0	0	0	0
95	Scott	0	0	0	0	**131**	Loudoun	1	0	5	0
96	Scott	0	0	0	0	**132**	Loudoun	1	1	46	1
97	Scott	0	0	0	0	**133**	Loudoun	0	0	0	0
98	Scott	0	0	0	0	**134**	Loudoun	0	0	0	0
99	Scott	0	0	0	0	**135**	Loudoun	0	0	0	0
100	Scott	1	1	35	1	**136**	Loudoun	0	0	0	0
101	Lee	1	1	22	2	**137**	Loudoun	0	0	0	0
102	Lee	0	0	0	0	**138**	Loudoun	0	0	0	0
103	Lee	1	1	10	2	**139**	Loudoun	1	0	13	0
104	Lee	1	0	27	0	**140**	Loudoun	1	0	1	0
105	Lee	0	0	0	0	**141**	Loudoun	0	0	0	0
106	Lee	0	0	0	0	**142**	Loudoun	0	0	0	0
107	Lee	1	0	2	0	**143**	Loudoun	1	0	1	0
108	Lee	1	0	1	0	**144**	Loudoun	0	0	0	0
109	Lee	1	1	8	1	**145**	Loudoun	1	0	74	0

Sample#	County	TC_Bin	EC_Bin	TC_MPN	EC_MPN	Sample#	County	TC_Bin	EC_Bin	TC_MPN	EC_MPN
146	Loudoun	0	0	0	0	**192**	Isle of Wight	0	0	0	0
147	Loudoun	1	0	23	0	**193**	Isle of Wight	1	0	1	0
148	Loudoun	0	0	0	0	**194**	Isle of Wight	0	0	0	0
149	Loudoun	1	1	41	6	**195**	Isle of Wight	0	0	0	0
150	Loudoun	0	0	0	0	**205**	Lunenburg	0	0	0	0
151	Loudoun	0	0	0	0	**206**	Lunenburg	1	0	2	0
152	Loudoun	0	0	0	0	**207**	Lunenburg	0	0	0	0
153	Loudoun	0	0	0	0	**208**	Lunenburg	1	0	27	0
154	Loudoun	0	0	0	0	**209**	Lunenburg	0	0	0	0
155	Loudoun	0	0	0	0	**210**	Lunenburg	0	0	0	0
156	Loudoun	0	0	0	0	**211**	Lunenburg	0	0	0	0
157	Loudoun	0	0	0	0	**212**	Buckingham	0	0	0	0
158	Loudoun	0	0	0	0	**213**	Buckingham	1	0	20	0
159	Loudoun	0	0	0	0	**214**	Buckingham	0	0	0	0
160	Loudoun	0	0	0	0	**215**	Buckingham	0	0	0	0
161	Loudoun	0	0	0	0	**216**	Buckingham	1	0	25	0
162	Loudoun	0	0	0	0	**217**	Buckingham	1	0	130	0
163	Loudoun	1	0	1	0	**218**	Buckingham	1	0	2	0
164	Loudoun	0	0	0	0	**219**	Buckingham	1	0	227	0
165	Loudoun	0	0	0	0	**220**	Buckingham	1	0	39	0
166	Loudoun	0	0	0	0	**221**	Buckingham	1	0	145	0
167	Loudoun	1	1	72	33	**222**	Buckingham	1	0	100	0
168	Loudoun	1	0	3	0	**223**	Buckingham	1	0	22	0
169	Loudoun	1	1	78	2	**224**	Buckingham	0	0	0	0
180	Isle of Wight	0	0	0	0	**225**	Buckingham	1	0	2	0
181	Isle of Wight	0	0	0	0	**226**	Buckingham	0	0	0	0
182	Isle of Wight	0	0	0	0	**227**	Buckingham	1	0	746	0
183	Isle of Wight	1	0	12	0	**228**	Buckingham	1	1	289	6
184	Isle of Wight	0	0	0	0	**229**	Buckingham	1	0	136	0
185	Isle of Wight	0	0	0	0	**236**	Louisa	1	0	6	0
186	Isle of Wight	0	0	0	0	**237**	Spotsylvania	1	1	41	1
187	Isle of Wight	0	0	0	0	**238**	Spotsylvania	0	0	0	0
188	Isle of Wight	1	0	58	0	**239**	Spotsylvania	1	0	5	0
189	Isle of Wight	0	0	0	0	**240**	Spotsylvania	0	0	0	0
190	Isle of Wight	0	0	0	0	**241**	Spotsylvania	1	1	447	5
191	Isle of Wight	1	1	5136	160	**242**	Fredericksburg	1	0	143	0

Sample#	County	TC_Bin	EC_Bin	TC_MPN	EC_MPN	Sample#	County	TC_Bin	EC_Bin	TC_MPN	EC_MPN
243	Spotsylvania	1	0	15	0	**279**	Spotsylvania	0	0	0	0
244	Fredericksburg	0	0	0	0	**280**	Spotsylvania	1	1	1216	103
245	Spotsylvania	1	0	5	0	**281**	Fredericksburg	0	0	0	0
246	Fredericksburg	0	0	0	0	**282**	Stafford	1	1	321	261
247	Spotsylvania	1	0	39	0	**283**	Spotsylvania	1	0	20	0
248	King George	0	0	0	0	**284**	Spotsylvania	0	0	0	0
249	Louisa	0	0	0	0	**285**	Spotsylvania	0	0	0	0
250	Stafford	1	0	24	0	**286**	Stafford	0	0	0	0
251	Spotsylvania	0	0	0	0	**287**	Stafford	1	0	29	0
252	Spotsylvania	0	0	0	0	**288**	Fredericksburg	0	0	0	0
253	Spotsylvania	1	0	15	0	**289**	Spotsylvania	0	0	0	0
254	Spotsylvania	0	0	0	0	**290**	Fredericksburg	1	1	67	1
255	Fredericksburg	0	0	0	0	**291**	Fredericksburg	0	0	0	0
256	Spotsylvania	0	0	0	0	**292**	Stafford	1	0	117	0
257	Fredericksburg	1	0	2	0	**293**	Fredericksburg	0	0	0	0
258	Spotsylvania	0	0	0	0	**294**	Stafford	0	0	0	0
259	Spotsylvania	0	0	0	0	**295**	Fredericksburg	1	0	6	0
260	Fredericksburg	0	0	0	0	**296**	Fredericksburg	0	0	0	0
261	Orange	0	0	0	0	**297**	Fredericksburg	0	0	0	0
262	Fredericksburg	0	0	0	0	**298**	Fredericksburg	1	1	5136	5136
263	Spotsylvania	0	0	0	0	**299**	Fredericksburg	1	0	83	0
264	Fredericksburg	1	0	20	0	**300**	Louisa	0	0	0	0
265	Spotsylvania	1	0	37	0	**301**	Fredericksburg	1	1	39	10
266	Spotsylvania	1	1	26	11	**302**	Fredericksburg	0	0	0	0
267	Fredericksburg	0	0	0	0	**303**	Spotsylvania	1	0	31	0
268	Fredericksburg	0	0	0	0	**304**	Fredericksburg	1	0	28	0
269	Spotsylvania	0	0	0	0	**305**	Fredericksburg	1	1	62	152
270	Louisa	0	0	0	0	**306**	Spotsylvania	1	1	601	703
271	Spotsylvania	0	0	0	0	**307**	Stafford	1	0	5	0
272	Fredericksburg	1	0	.	.	**308**	Stafford	1	0	3	0
273	Spotsylvania	0	0	0	0	**309**	Stafford	0	0	0	0
274	Stafford	0	0	0	0	**310**	Stafford	1	1	5136	11
275	Fredericksburg	0	0	0	0	**311**	Fredericksburg	0	0	0	0
276	Fredericksburg	0	0	0	0	**312**	Fredericksburg	0	0	0	0
277	Fredericksburg	0	0	0	0	**313**	Spotsylvania	1	0	63	0
278	Spotsylvania	0	0	0	0	**314**	Spotsylvania	0	0	0	0

Sample#	**County**	**TC_Bin**	**EC_Bin**	**TC_MPN**	**EC_MPN**	**Sample#**	**County**	**TC_Bin**	**EC_Bin**	**TC_MPN**	**EC_MPN**
315	Fredericksburg	0	0	0	0	**351**	Fredericksburg	0	0	0	0
316	Caroline	1	1	78	3	**352**	Orange	0	0	0	0
317	Fredericksburg	1	0	1	0	**353**	Spotsylvania	1	0	289	0
318	Stafford	0	0	0	0	**354**	Fredericksburg	0	0	0	0
319	Fredericksburg	1	1	21	1	**355**	Fredericksburg	0	0	0	0
320	Fredericksburg	0	0	0	0	**356**	Fredericksburg	1	0	4	0
321	Westmorela.	0	0	0	0	**357**	Fredericksburg	1	0	2	0
322	Fredericksburg	1	1	157	1	**358**	Fredericksburg	0	0	0	0
323	Spotsylvania	1	0	59	0	**359**	Fredericksburg	1	1	5136	2
324	Spotsylvania	0	0	0	0	**360**	Fredericksburg	0	0	0	0
325	Fredericksburg	1	0	140	0	**361**	Fredericksburg	0	0	0	0
326	Fredericksburg	0	0	0	0	**362**	Spotsylvania	0	0	0	0
327	Fredericksburg	1	0	36	0	**363**	Spotsylvania	0	0	0	0
328	Spotsylvania	0	0	0	0	**364**	Spotsylvania	0	0	0	0
329	Stafford	0	0	0	0	**365**	Spotsylvania	0	0	0	0
330	Stafford	1	1	1492	13	**366**	Spotsylvania	0	0	0	0
331	Stafford	1	1	103	6	**367**	Stafford	1	1	275	152
332	Spotsylvania	0	0	0	0	**368**	Fredericksburg	1	0	964	0
333	Fredericksburg	0	0	0	0	**369**	Fredericksburg	1	0	1337	0
334	Fredericksburg	0	0	0	0	**370**	Louisa	0	0	0	0
335	Stafford	0	0	0	0	**371**	Spotsylvania	0	0	0	0
336	Spotsylvania	1	0	2	0	**372**	Spotsylvania	1	0	3	0
337	Spotsylvania	0	0	0	0	**373**	Stafford	0	0	0	0
338	Fredericksburg	1	1	472	87	**374**	Spotsylvania	1	0	11	0
339	Fredericksburg	0	0	0	0	**375**	Spotsylvania	1	0	214	0
340	Fredericksburg	1	0	11	0	**376**	Fredericksburg	1	0	793	0
341	Fredericksburg	1	0	88	0	**377**	King George	0	0	0	0
342	Fredericksburg	1	0	160	0	**378**	Spotsylvania	0	0	0	0
343	Stafford	1	0	57	0	**379**	Spotsylvania	1	0	5	0
344	Fredericksburg	0	0	0	0	**380**	Spotsylvania	1	1	5136	55
345	Fredericksburg	0	0	0	0	**381**	Fredericksburg	0	0	0	0
346	Fredericksburg	0	0	0	0	**382**	Fredericksburg	1	0	4	0
347	Fredericksburg	0	0	0	0	**383**	Fredericksburg	0	0	0	0
348	Fredericksburg	0	0	0	0	**384**	Stafford	1	0	32	0
349	Fredericksburg	0	0	0	0	**385**	Spotsylvania	0	0	0	0
350	Fredericksburg	1	0	591	0	**386**	Spotsylvania	0	0	0	0

Sample#	County	TC_Bin	EC_Bin	TC_MPN	EC_MPN	Sample#	County	TC_Bin	EC_Bin	TC_MPN	EC_MPN
387	Spotsylvania	0	0	.	.	**424**	Spotsylvania	0	0	.	.
388	Spotsylvania	0	0	.	.	**425**	Fredericksburg	1	0	.	.
389	Spotsylvania	0	0	.	.	**426**	Stafford	0	0	.	.
390	Spotsylvania	1	0	.	.	**427**	Fredericksburg	1	0	.	.
391	Spotsylvania	1	0	.	.	**428**	Spotsylvania	0	0	.	.
392	Spotsylvania	0	0	.	.	**429**	Fredericksburg	1	0	.	.
393	Spotsylvania	1	0	.	.	**430**	Fredericksburg	0	0	.	.
394	Spotsylvania	0	0	.	.	**431**	Spotsylvania	0	0	.	.
395	Spotsylvania	0	0	.	.	**432**	Spotsylvania	0	0	.	.
396	Spotsylvania	1	0	.	.	**433**	Spotsylvania	1	0	.	.
397	Spotsylvania	0	0	.	.	**434**	Spotsylvania	1	0	.	.
398	Fredericksburg	1	0	.	.	**435**	Fredericksburg	1	0	.	.
399	Fredericksburg	1	1	.	.	**436**	Spotsylvania	0	0	.	.
400	Fredericksburg	0	0	.	.	**437**	Fredericksburg	0	0	.	.
401	Fredericksburg	0	0	.	.	**438**	Spotsylvania	0	0	.	.
402	Spotsylvania	1	0	.	.	**439**	Spotsylvania	0	0	.	.
403	Spotsylvania	0	0	.	.	**440**	Louisa	1	0	.	.
405	Fredericksburg	1	1	.	.	**441**	Spotsylvania	1	0	.	.
406	Spotsylvania	0	0	.	.	**442**	Spotsylvania	0	0	.	.
407	Stafford	0	0	.	.	**443**	Spotsylvania	1	0	.	.
408	Spotsylvania	0	0	.	.	**444**	Fredericksburg	1	1	.	.
409	Fredericksburg	1	0	.	.	**445**	Fredericksburg	0	0	.	.
410	Spotsylvania	0	0	.	.	**446**	Fredericksburg	1	0	.	.
411	Spotsylvania	0	0	.	.	**447**	Fredericksburg	0	0	.	.
412	Fredericksburg	1	0	.	.	**448**	Fredericksburg	0	0	.	.
413	Spotsylvania	1	0	.	.	**449**	Fredericksburg	0	0	.	.
414	Caroline	0	0	.	.	**450**	Stafford	0	0	.	.
415	Fredericksburg	0	0	.	.	**451**	Stafford	0	0	.	.
416	Stafford	0	0	.	.	**452**	Spotsylvania	0	0	.	.
417	Spotsylvania	1	0	.	.	**453**	Caroline	0	0	.	.
418	Stafford	1	0	.	.	**454**	Louisa	0	0	.	.
419	Fredericksburg	1	0	.	.	**455**	Spotsylvania	0	0	.	.
420	Spotsylvania	0	0	.	.	**456**	Fredericksburg	0	0	.	.
421	Stafford	1	0	.	.	**457**	Spotsylvania	0	0	.	.
422	Spotsylvania	0	0	.	.	**458**	Fredericksburg	0	0	.	.
423	Louisa	0	0	.	.	**459**	Spotsylvania	1	0	.	.

Sample#	County	TC_Bin	EC_Bin	TC_MPN	EC_MPN	Sample#	County	TC_Bin	EC_Bin	TC_MPN	EC_MPN
460	Louisa	0	0	.	.	**496**	Spotsylvania	0	0	.	.
461	Fredericksburg	1	0	.	.	**497**	Louisa	0	0	.	.
462	Fredericksburg	0	0	.	.	**498**	Spotsylvania	0	0	.	.
463	Spotsylvania	0	0	.	.	**499**	Spotsylvania	1	0	.	.
464	Louisa	0	0	.	.	**500**	Stafford	0	0	.	.
465	Fredericksburg	0	0	.	.	**501**	Stafford	1	1	.	.
466	Fredericksburg	1	0	.	.	**502**	Louisa	0	0	.	.
467	Louisa	0	0	.	.	**503**	Stafford	1	0	.	.
468	Spotsylvania	0	0	.	.	**504**	Stafford	0	0	.	.
469	Fredericksburg	1	0	.	.	**505**	Caroline	1	0	.	.
470	Spotsylvania	0	0	.	.	**506**	Fredericksburg	0	0	.	.
471	Spotsylvania	0	0	.	.	**507**	Spotsylvania	0	0	.	.
472	Stafford	1	0	.	.	**508**	Spotsylvania	0	0	.	.
473	Stafford	0	0	.	.	**509**	Fredericksburg	1	0	.	.
474	Spotsylvania	0	0	.	.	**510**	Fredericksburg	0	0	.	.
475	Fredericksburg	1	0	.	.	**511**	Fredericksburg	1	0	.	.
476	Stafford	0	0	.	.	**512**	Fredericksburg	0	0	.	.
477	Fredericksburg	0	0	.	.	**513**	Louisa	0	0	.	.
478	Fredericksburg	1	0	.	.	**514**	Fredericksburg	1	0	.	.
479	Spotsylvania	1	0	.	.	**515**	Louisa	0	0	.	.
480	Spotsylvania	0	0	.	.	**516**	Spotsylvania	0	0	.	.
481	Stafford	0	0	.	.	**517**	Louisa	0	0	.	.
482	King George	1	0	.	.	**518**	Spotsylvania	1	0	.	.
483	King George	0	0	.	.	**519**	Spotsylvania	1	0	.	.
484	Stafford	1	0	.	.	**520**	Louisa	0	0	.	.
485	Fredericksburg	1	0	.	.	**521**	Fredericksburg	1	0	.	.
486	Fredericksburg	1	0	.	.	**522**	Fredericksburg	0	0	.	.
487	Fredericksburg	1	0	.	.	**523**	Fredericksburg	0	0	.	.
488	Fredericksburg	1	0	.	.	**524**	Fredericksburg	1	0	.	.
489	Fredericksburg	0	0	.	.	**525**	Spotsylvania	0	0	.	.
490	Louisa	1	0	.	.	**526**	Louisa	0	0	.	.
491	Fredericksburg	0	0	.	.	**527**	Stafford	1	1	.	.
492	Caroline	1	0	.	.	**528**	Fredericksburg	0	0	.	.
493	Spotsylvania	0	0	.	.	**529**	Fredericksburg	0	0	.	.
494	Fauquier	1	0	.	.	**530**	Spotsylvania	0	0	.	.
495	Spotsylvania	0	0	.	.	**531**	Spotsylvania	0	0	.	.

Sample#	County	TC_Bin	EC_Bin	TC_MPN	EC_MPN
532	Fredericksburg	0	0	.	.
533	Spotsylvania	1	0	.	.
534	Louisa	1	0	.	.
535	Fredericksburg	0	0	.	.
536	Louisa	0	0	.	.
537	Spotsylvania	0	0	.	.
538	Spotsylvania	1	1	.	.
539	Fredericksburg	0	0	.	.
540	Louisa	0	0	.	.
541	Fredericksburg	0	0	.	.
542	Spotsylvania	0	0	.	.
543	Fredericksburg	0	0	.	.
544	Spotsylvania	0	0	.	.
545	Spotsylvania	0	0	.	.
546	Fredericksburg	1	0	.	.
547	Spotsylvania	0	0	.	.
548	Spotsylvania	0	0	.	.
549	Fredericksburg	1	0	.	.
550	Spotsylvania	0	0	.	.
551	Spotsylvania	0	0	.	.
552	Spotsylvania	0	0	.	.
553	Spotsylvania	0	0	.	.
554	Spotsylvania	1	0	.	.
555	Spotsylvania	0	0	.	.
556	Spotsylvania	0	0	.	.
557	Spotsylvania	0	0	.	.
558	Stafford	1	1	.	.
559	Fredericksburg	0	0	.	.
560	Spotsylvania	1	0	.	.
561	Spotsylvania	0	0	.	.
562	Spotsylvania	1	0	.	.
563	Fredericksburg	1	0	.	.
564	Louisa	0	0	.	.
565	Fredericksburg	0	0	.	.
566	Stafford	0	0	.	.
569	Spotsylvania	0	0	.	.

Table B4. Well and System Characteristics

Sample#	County	Source	Treatment	Acid Neutralizer	Carbon Filter	Chlorinator	Iron Filter	Sediment Filter	Water Softener	DEPTH	YEAR	Shared	Location
1	Smyth	DW	0	0	0	0	0	0	0	.	.	0	FARM
2	Smyth	DW	1	0	0	0	0	0	1	300	1992	0	RRL
3	Smyth	SPR	0	0	0	0	0	0	0	150	2000	0	FARM
4	Smyth	DW	0	0	0	0	0	0	0	400	1970	0	RRL
5	Smyth	SPR	0	0	0	0	0	0	0	.	2000	0	FARM
6	Smyth	DW	0	0	0	0	0	0	0	.	.	0	RRL
7	Smyth	DW	1	0	0	0	0	0	0	189	1975	0	FARM
8	Smyth	SPR	0	0	0	0	0	0	0	.	.	1	FARM
9	Smyth	CIS	1	0	0	0	0	1	0	.	.	0	RRL
10	Smyth	DW	1	0	0	0	0	1	0	206	1972	0	RRL
11	Smyth	SPR	0	0	0	0	0	0	0	.	.	1	FARM
12	Smyth	.	0	0	0	0	0	0	0	225	.	0	RRL
13	Smyth	DW	1	0	0	0	0	0	0	.	.	0	IRC
14	Smyth	DW	0	0	0	0	0	0	0	460	2005	0	FARM
15	Smyth	DW	0	0	0	0	0	0	0	.	.	0	FARM
16	Smyth	DW	0	0	0	0	0	0	0	320	1980	1	FARM
17	Smyth	DW	0	0	0	0	0	0	0	285	1978	0	FARM
18	Smyth	SPR	0	0	0	0	0	0	0	.	.	0	FARM
19	Smyth	DW	1	0	0	0	0	1	0	.	.	0	SUB
20	Smyth	SPR	0	0	0	0	0	0	0	680	2005	1	FARM
21	Smyth	DW	1	0	0	0	0	0	1	.	.	0	IRC
22	Smyth	SPR	0	0	0	0	0	0	0	.	.	0	FARM
23	Russell	DW	0	0	0	0	0	0	0	165	1959	1	FARM
24	Russell	.	0	0	0	0	0	0	0	.	.	1	IRC
25	Russell	DW	0	0	0	0	0	0	0	.	.	0	FARM
26	Russell	DW	1	0	0	0	0	1	0	425	1988	1	FARM
27	Tazewell	DW	0	0	0	0	0	0	0	600	1998	0	FARM
28	Tazewell	SPR	1	0	0	0	0	1	0	100	2007	1	FARM
29	Russell	DW	0	0	0	0	0	0	0	598	1978	1	FARM
30	Tazewell	DW	1	0	0	0	0	0	0	325	2003	0	.
31	Tazewell	DW	0	0	0	0	0	0	0	185	1987	1	.
32	Tazewell	DW	0	0	0	0	0	0	0	220	2010	0	.
33	Tazewell	DW	0	0	0	0	0	0	0	.	.	1	FARM
34	Tazewell	DW	0	0	0	0	0	0	0	90	1969	0	FARM

Sample#	County	Source	Treatment	Acid Neutralizer	Carbon Filter	Chlorinator	Iron Filter	Sediment Filter	Water Softener	DEPTH	YEAR	Shared	Location
35	Tazewell	SPR	1	0	0	0	0	0	1	.	.	1	FARM
36	Tazewell	SPR	1	0	0	0	0	0	0	.	2000	0	FARM
37	Tazewell	DW	1	0	0	0	0	0	0	.	.	1	FARM
40	Frederick	DW	1	0	0	0	1	0	1	225	.	0	FARM
41	Frederick	DW	1	0	0	0	1	0	0	.	1978	0	FARM
42	Frederick	DW	1	0	0	0	0	0	1	.	1990	0	SUB
43	Frederick	DW	1	0	0	0	1	0	1	240	2006	0	IRC
44	Frederick	DW	1	0	0	0	0	0	1	300	2006	0	SUB
45	Frederick	DW	1	0	0	0	0	1	1	120	1978	0	IRC
46	Frederick	DW	1	0	0	0	0	0	1	125	2009	0	IRC
47	Frederick	DW	1	0	0	0	0	0	1	.	1970	0	SUB
48	Frederick	DW	1	0	0	0	0	0	1	400	2002	0	SUB
49	Frederick	DW	1	0	0	0	0	0	1	.	.	0	IRC
50	Clarke	DW	1	0	0	0	0	1	1	420	1978	0	IRC
51	Frederick	DW	1	0	0	0	1	0	0	.	.	0	IRC
52	Frederick	DW	1	0	0	0	0	1	1	250	1963	0	RRL
53	Frederick	DW	1	0	0	0	0	0	1	305	2006	0	RRL
54	Frederick	DW	1	0	0	0	0	1	1	275	1986	0	FARM
55	Frederick	DW	1	0	1	0	0	0	1	300	1993	0	IRC
56	Clarke	.	1	0	0	0	0	0	1	.	.	0	FARM
57	Frederick	DW	1	0	0	0	0	0	1	300	1973	0	.
58	Frederick	DW	0	0	0	0	0	0	0	.	.	0	IRC
59	Clarke	DW	1	0	0	0	0	0	1	126	1968	0	FARM
60	Clarke	DW	0	0	0	0	0	0	0	450	1995	0	IRC
61	Frederick	DW	1	0	1	0	0	1	0	190	.	1	IRC
62	Frederick	DW	1	0	1	0	0	1	1	610	.	0	IRC
63	Frederick	DBW	1	0	0	0	1	0	1	500	1998	0	SUB
64	Frederick	DW	1	0	0	0	0	0	1	.	1967	0	SUB
65	Clarke	DW	1	0	0	0	0	0	1	.	2000	1	FARM
66	Frederick	DW	1	0	0	0	0	0	1	.	1982	0	IRC
67	Clarke	DW	0	0	0	0	0	0	0	200	1922	0	FARM
68	Clarke	DW	0	0	0	0	0	0	0	250	1960	0	RRL
69	Clarke	DW	0	0	0	0	0	0	0	.	1997	0	FARM
70	Clarke	DW	1	0	0	0	0	1	0	287	1999	0	RRL
71	Clarke	DW	1	0	0	0	0	0	1	380	1975	0	RRL

Sample#	County	Source	Treatment	Acid Neutralizer	Carbon Filter	Chlorinator	Iron Filter	Sediment Filter	Water Softener	DEPTH	YEAR	Shared	Location
72	Clarke	DW	0	0	0	0	0	0	0	700	2001	0	FARM
73	Clarke	DW	1	0	0	0	0	1	1	190	1994	0	FARM
74	Clarke	DW	1	0	1	0	0	1	1	285	1994	0	FARM
75	Frederick	DW	1	0	0	0	0	1	1	.	1991	0	.
76	Frederick	DW	1	0	0	0	0	1	0	220	1976	0	FARM
77	Frederick	DW	1	0	0	0	0	0	1	280	2001	0	RRL
78	Frederick	DW	1	0	0	0	0	0	1	.	2002	0	IRC
79	Frederick	DW	1	0	0	0	0	0	1	350	1970	0	FARM
80	Frederick	DW	1	0	0	0	1	0	1	70	1978	0	SUB
81	Frederick	DW	1	0	0	0	0	0	1	500	2008	0	IRC
82	Frederick	DW	1	0	0	0	0	0	1	999	1962	0	IRC
83	Clarke	DW	1	0	1	0	0	1	1	300	1935	0	FARM
84	Frederick	DW	1	0	0	0	0	0	1	.	2005	0	RRL
85	Frederick	.	1	0	0	0	0	0	1	300	2002	1	RRL
86	Clarke	DW	1	0	0	0	0	1	1	0	1970	0	IRC
87	Clarke	DW	1	0	0	0	0	0	1	200	1965	0	FARM
88	Clarke	DW	1	0	0	0	0	1	0	.	.	0	IRC
89	Frederick	DW	0	0	0	0	0	0	0	280	1984	0	RRL
90	Frederick	DW	1	0	0	0	0	0	1	150	1980	0	IRC
92	Scott	SPR	0	0	0	0	0	0	0	.	.	0	IRC
93	Scott	DW	0	0	0	0	0	0	0	.	.	0	FARM
94	Scott	DW	0	0	0	0	0	0	0	500	1998	0	FARM
95	Scott	DW	0	0	0	0	0	0	0	430	1980	0	FARM
96	Scott	DW	0	0	0	0	0	0	0	500	2005	0	FARM
97	Scott	.	0	0	0	0	0	0	0	.	.	0	SUB
98	Scott	DW	0	0	0	0	0	0	0	550	2002	0	IRC
99	Scott	DW	1	0	0	0	0	1	0	140	2008	0	IRC
100	Scott	DW	0	0	0	0	0	0	0	97	1970	0	IRC
101	Lee	DW	0	0	0	0	0	0	0	220	.	0	FARM
102	Lee	DW	0	0	0	0	0	0	0	400	2005	0	RRL
103	Lee	.	0	0	0	0	0	0	0	.	1995	0	IRC
104	Lee	DW	0	0	0	0	0	0	0	.	.	1	RRL
105	Lee	SPR	1	0	0	0	0	1	0	.	.	0	FARM
106	Lee	.	0	0	0	0	0	0	0	.	.	0	FARM
107	Lee	DW	0	0	0	0	0	0	0	150	.	0	FARM

Sample#	County	Source	Treatment	Acid Neutralizer	Carbon Filter	Chlorinator	Iron Filter	Sediment Filter	Water Softener	DEPTH	YEAR	Shared	Location
108	Lee	DW	0	0	0	0	0	0	0	150	.	0	FARM
109	Lee	.	0	0	0	0	0	0	0	.	.	0	FARM
110	Lee	.	0	0	0	0	0	0	0	60	1950	0	FARM
111	Loudoun	DBW	1	0	0	0	0	0	1	.	.	0	RRL
112	Loudoun	DBW	0	0	0	0	0	0	0	425	.	0	FARM
113	Loudoun	DW	0	0	0	0	0	0	0	200	1978	0	IRC
114	Loudoun	DW	1	0	0	0	0	1	0	.	1989	1	IRC
115	Loudoun	DW	1	1	0	0	0	0	1	200	1994	0	IRC
116	Loudoun	DW	1	0	0	0	0	1	1	.	1992	0	IRC
117	Loudoun	DW	0	0	0	0	0	0	0	.	1974	0	FARM
118	Loudoun	DW	0	0	0	0	0	0	0	600	.	0	FARM
119	Loudoun	DW	1	0	0	0	0	0	0	640	.	0	IRC
120	Loudoun	DW	1	0	0	0	1	0	0	600	2001	0	RRL
121	Loudoun	DW	1	0	1	0	0	0	0	119	2006	0	IRC
122	Loudoun	DW	1	0	1	0	0	0	0	150	2006	0	IRC
123	Loudoun	DW	1	0	0	0	0	1	0	400	.	0	RRL
124	Loudoun	DW	1	1	0	0	0	0	0	100	1977	0	IRC
125	Loudoun	DW	0	0	0	0	0	0	0	120	2010	0	IRC
126	Loudoun	DBW	0	0	0	0	0	0	0	400	1980	0	RRL
127	Loudoun	DW	1	0	0	0	0	1	1	.	.	0	FARM
128	Loudoun	DW	0	0	0	0	0	0	0	428	2010	0	SUB
129	Loudoun	.	0	0	0	0	0	0	0	.	.	0	FARM
130	Loudoun	DW	1	0	0	0	0	1	1	180	2003	1	IRC
131	Loudoun	SPR	0	0	0	0	0	0	0	500	.	0	RRL
132	Loudoun	DW	1	0	0	0	0	1	0	180	1975	0	IRC
133	Loudoun	DW	1	0	0	0	0	1	0	250	2005	0	SUB
134	Loudoun	DW	0	0	0	0	0	0	0	.	1984	0	RRL
135	Loudoun	DW	1	0	0	0	1	1	0	175	.	0	FARM
136	Loudoun	.	0	0	0	0	0	0	0	100	.	0	IRC
137	Loudoun	DW	1	0	0	0	0	1	1	340	1974	0	FARM
138	Loudoun	DW	0	0	0	0	0	0	0	.	1994	0	SUB
139	Loudoun	DW	1	0	0	0	0	1	0	600	1981	0	RRL
140	Loudoun	DW	0	0	0	0	0	0	0	260	2003	0	IRC
141	Loudoun	DW	1	0	0	0	0	0	1	700	.	0	FARM
142	Loudoun	DW	1	0	0	0	0	1	0	.	1994	0	FARM

Sample#	County	Source	Treatment	Acid Neutralizer	Carbon Filter	Chlorinator	Iron Filter	Sediment Filter	Water Softener	DEPTH	YEAR	Shared	Location
143	Loudoun	DW	1	0	0	0	0	1	0	.	1994	0	RRL
144	Loudoun	DW	1	0	0	0	0	1	0	.	1994	0	RRL
145	Loudoun	DW	1	0	0	0	0	1	0	.	1994	0	RRL
146	Loudoun	DW	1	0	0	0	0	1	0	.	1994	0	RRL
147	Loudoun	DW	1	0	0	0	0	1	0	.	1994	0	RRL
148	Loudoun	DW	1	0	0	0	0	1	0	.	1994	0	RRL
149	Loudoun	DW	1	0	0	0	0	1	0	.	1994	0	RRL
150	Loudoun	DW	1	0	0	0	0	1	0	.	1994	0	RRL
151	Loudoun	DW	1	0	0	0	0	1	0	.	1994	0	RRL
152	Loudoun	DW	1	0	0	0	0	1	0	.	1994	0	RRL
153	Loudoun	DW	1	0	0	0	0	1	0	.	1994	0	RRL
154	Loudoun	DW	1	0	0	0	0	1	0	.	1994	0	RRL
155	Loudoun	DW	1	0	0	0	0	1	0	.	1994	0	RRL
156	Loudoun	DW	1	0	0	0	0	1	0	.	1994	0	RRL
157	Loudoun	DW	1	0	0	0	0	1	0	.	1994	0	RRL
158	Loudoun	DW	1	0	0	0	0	1	0	.	1994	0	RRL
159	Loudoun	DW	1	0	0	0	0	1	0	.	1994	0	RRL
160	Loudoun	DW	1	0	0	0	0	1	0	.	1994	0	RRL
161	Loudoun	DW	1	0	0	0	0	1	0	.	1994	0	RRL
162	Loudoun	DW	1	0	0	0	0	1	0	.	1994	0	RRL
163	Loudoun	DW	1	0	0	0	0	1	0	.	1994	0	RRL
164	Loudoun	DW	1	0	0	0	0	1	0	.	1994	0	RRL
165	Loudoun	DW	1	0	0	0	1	0	1	.	2006	0	SUB
166	Loudoun	DW	0	0	0	0	0	0	0	320	.	0	IRC
167	Loudoun	DW	1	0	0	0	0	0	1	165	1984	0	IRC
168	Loudoun	DW	1	0	1	0	0	0	0	0	1976	0	FARM
169	Loudoun	DW	1	0	0	0	0	0	1	0	1993	0	IRC
180	Isle of Wight	DW	0	0	0	0	0	0	0	360	1998	0	RRL
181	Isle of Wight	DW	0	0	0	0	0	0	0	400	1990	0	IRC
182	Isle of Wight	DW	0	0	0	0	0	0	0	500	1988	0	RRL
183	Isle of Wight	DW	0	0	0	0	0	0	0	150	1990	1	IRC
184	Isle of Wight	DW	1	0	0	0	0	1	0	400	1995	0	IRC
185	Isle of Wight	DBW	0	0	0	0	0	0	0	700	1977	0	IRC
186	Isle of Wight	DW	0	0	0	0	0	0	0	500	2006	0	RRL
187	Isle of Wight	DW	0	0	0	0	0	0	0	.	1986	0	IRC

Sample#	County	Source	Treatment	Acid Neutralizer	Carbon Filter	Chlorinator	Iron Filter	Sediment Filter	Water Softener	DEPTH	YEAR	Shared	Location
188	Isle of Wight	DBW	0	0	0	0	0	0	0	50	1991	0	RRL
189	Isle of Wight	.	0	0	0	0	0	0	0	.	1999	0	RRL
190	Isle of Wight	DW	0	0	0	0	0	0	0	.	1980	1	IRC
191	Isle of Wight	DBW	0	0	0	0	0	0	0	85	1958	0	RRL
192	Isle of Wight	DW	0	0	0	0	0	0	0	480	2010	0	RRL
193	Isle of Wight	DW	0	0	0	0	0	0	0	300	2006	0	IRC
194	Isle of Wight	.	1	0	0	0	0	1	0	38	2006	0	IRC
195	Isle of Wight	DW	0	0	0	0	0	0	0	.	1976	0	RRL
205	Lunenburg	DBW	0	0	0	0	0	0	0	385	2006	0	FARM
206	Lunenburg	DW	0	0	0	0	0	0	0	220	1987	0	FARM
207	Lunenburg	DW	1	0	0	0	1	0	0	250	2004	0	FARM
208	Lunenburg	DBW	0	0	0	0	0	0	0	0	1949	0	FARM
209	Lunenburg	DW	1	0	0	0	0	1	0	0	0	0	FARM
210	Lunenburg	DW	0	0	0	0	0	0	0	160	1994	0	FARM
211	Lunenburg	DW	0	0	0	0	0	0	0	180	0	0	FARM
212	Buckingham	DW	0	0	0	0	0	0	0	90	1996	0	FARM
213	Buckingham	DBW	0	0	0	0	0	0	0	44	1978	0	FARM
214	Buckingham	DW	1	0	1	0	0	0	0	150	2010	0	RRL
215	Buckingham	DBW	0	0	0	0	0	0	0	.	.	0	RRL
216	Buckingham	DW	0	0	0	0	0	0	0	285	1960	0	IRC
217	Buckingham	DW	0	0	0	0	0	0	0	.	.	0	IRC
218	Buckingham	DW	0	0	0	0	0	0	0	.	2003	0	FARM
219	Buckingham	DW	0	0	0	0	0	0	0	.	.	0	FARM
220	Buckingham	DW	0	0	0	0	0	0	0	225	1977	0	IRC
221	Buckingham	DBW	0	0	0	0	0	0	0	.	.	1	FARM
222	Buckingham	DBW	0	0	0	0	0	0	0	.	.	0	RRL
223	Buckingham	DBW	1	0	0	0	0	1	0	.	2008	0	RRL
224	Buckingham	DW	1	0	0	0	0	0	0	.	2009	0	SUB
225	Buckingham	DW	0	0	0	0	0	0	0	.	2005	0	SUB
226	Buckingham	DW	0	0	0	0	0	0	0	117	2007	0	FARM
227	Buckingham	DBW	0	0	0	0	0	0	0	.	1968	1	RRL
228	Buckingham	DBW	0	0	0	0	0	0	0	180	2007	0	RRL
229	Buckingham	DW	0	0	0	0	0	0	0	50	1994	0	IRC
236	Louisa	DW	0	0	0	0	0	0	0	325	1991	0	SUB
237	Spotsylvania	DW	1	0	0	0	1	0	1	.	2006	0	IRC

Sample#	**County**	**Source**	**Treatment**	**Acid Neutralizer**	**Carbon Filter**	**Chlorinator**	**Iron Filter**	**Sediment Filter**	**Water Softener**	**DEPTH**	**YEAR**	**Shared**	**Location**
238	Spotsylvania	DW	1	0	0	1	0	1	1	.	1993	0	IRC
239	Spotsylvania	DBW	0	0	0	0	0	0	0	.	.	0	RRL
240	Spotsylvania	DBW	0	0	0	0	0	0	0	.	.	0	RRL
241	Spotsylvania	DBW	0	0	0	0	0	0	0	.	.	0	IRC
242	Fredericksburg	DW	1	0	0	0	0	0	1	.	1980	0	IRC
243	Spotsylvania	DBW	0	0	0	0	0	0	0	.	.	0	IRC
244	Fredericksburg	DW	0	0	0	0	0	0	0	.	2003	0	IRC
245	Spotsylvania	DBW	1	0	0	0	0	0	1	.	1964	0	FARM
246	Fredericksburg	DW	1	0	0	0	0	0	1	.	2010	0	IRC
247	Spotsylvania	DBW	0	0	0	0	0	0	0	55	1940	0	IRC
248	King George	DBW	0	0	0	0	0	0	0	.	2000	0	IRC
249	Louisa	DW	1	0	0	0	0	0	0	.	2002	0	IRC
250	Stafford	DW	0	0	0	0	0	0	0	.	1985	0	SUB
251	Spotsylvania	DW	1	0	0	0	1	1	1	325	1999	0	SUB
252	Spotsylvania	DW	1	0	0	1	0	0	1	380	1999	0	SUB
253	Spotsylvania	DW	0	0	0	0	0	0	0	380	1999	0	SUB
254	Spotsylvania	DW	1	0	0	0	1	0	1	340	1990	0	IRC
255	Fredericksburg	DW	1	0	0	0	0	1	0	400	1987	0	.
256	Spotsylvania	DW	1	0	0	0	0	1	1	.	1998	0	SUB
257	Fredericksburg	DW	1	0	0	0	0	1	0	240	2011	0	SUB
258	Spotsylvania	DW	0	0	0	0	0	0	0	.	.	0	IRC
259	Spotsylvania	DBW	1	0	0	0	0	0	0	32	1977	0	IRC
260	Fredericksburg	DW	1	0	0	0	0	1	0	.	2010	0	SUB
261	Orange	DW	0	0	0	0	0	0	0	.	2005	0	RRL
262	Fredericksburg	DW	0	0	0	0	0	0	0	.	2002	0	SUB
263	Spotsylvania	DW	1	0	0	0	0	0	1	360	2002	0	IRC
264	Fredericksburg	DW	1	0	0	0	0	1	0	295	1997	0	RRL
265	Spotsylvania	DBW	1	0	0	0	0	1	0	30	1986	0	IRC
266	Spotsylvania	.	0	0	0	0	0	0	0	.	.	0	IRC
267	Fredericksburg	DW	1	0	1	0	0	0	1	145	1993	0	SUB
268	Fredericksburg	DW	1	1	1	0	0	0	1	.	.	0	SUB
269	Spotsylvania	DW	1	0	0	0	1	0	1	.	1999	0	SUB
270	Louisa	DW	0	0	0	0	0	0	0	150	1992	0	IRC
271	Spotsylvania	DW	1	0	0	0	0	1	0	.	2004	0	RRL
272	Fredericksburg	DBW	0	0	0	0	0	0	0	.	1955	0	FARM

Sample#	County	Source	Treatment	Acid Neutralizer	Carbon Filter	Chlorinator	Iron Filter	Sediment Filter	Water Softener	DEPTH	YEAR	Shared	Location
273	Spotsylvania	DW	1	0	0	0	0	1	0	200	1991	0	SUB
274	Stafford	DW	0	0	0	0	0	0	0	300	1988	0	SUB
275	Fredericksburg	DW	1	1	0	1	0	1	1	280	2005	0	SUB
276	Fredericksburg	DW	1	0	0	0	0	0	0	.	.	0	SUB
277	Fredericksburg	.	1	0	0	0	1	0	1	.	.	0	SUB
278	Spotsylvania	DW	0	0	0	0	0	0	0	285	2004	0	SUB
279	Spotsylvania	DW	1	1	0	0	0	1	1	285	2004	0	SUB
280	Spotsylvania	DBW	0	0	0	0	0	0	0	50	1973	0	RRL
281	Fredericksburg	DBW	0	0	0	0	0	0	0	35	.	0	RRL
282	Stafford	DBW	1	1	0	0	0	0	0	.	.	0	RRL
283	Spotsylvania	DW	0	0	0	0	0	0	0	300	1999	0	FARM
284	Spotsylvania	DW	1	0	0	0	1	0	1	185	2006	0	SUB
285	Spotsylvania	DW	1	0	0	0	1	0	1	150	1994	0	SUB
286	Stafford	DBW	0	0	0	0	0	0	0	60	1960	0	IRC
287	Stafford	DBW	0	0	0	0	0	0	0	60	1957	0	IRC
288	Fredericksburg	.	1	0	0	0	0	0	1	.	.	0	SUB
289	Spotsylvania	DW	1	0	0	0	0	1	0	200	1994	0	FARM
290	Fredericksburg	DBW	1	0	0	0	0	1	1	.	1988	0	IRC
291	Fredericksburg	DW	0	0	0	0	0	0	0	.	.	0	IRC
292	Stafford	DBW	0	0	0	0	0	0	0	65	1968	0	FARM
293	Fredericksburg	DW	1	0	0	0	0	1	1	210	2006	0	IRC
294	Stafford	DW	1	0	0	0	0	1	0	700	2005	0	SUB
295	Fredericksburg	DBW	0	0	0	0	0	0	0	25	1983	0	IRC
296	Fredericksburg	DBW	1	0	0	0	0	0	0	55	1978	0	IRC
297	Fredericksburg	DW	0	0	0	0	0	0	0	.	1987	0	SUB
298	Fredericksburg	DBW	0	0	0	0	0	0	0	60	1945	0	IRC
299	Fredericksburg	DW	0	0	0	0	0	0	0	300	1985	0	SUB
300	Louisa	DW	1	0	0	0	0	1	0	380	1985	0	IRC
301	Fredericksburg	DBW	0	0	0	0	0	0	0	30	1972	0	IRC
302	Fredericksburg	DW	0	0	0	0	0	0	0	240	1993	0	IRC
303	Spotsylvania	DW	0	0	0	0	0	0	0	.	1991	0	SUB
304	Fredericksburg	DW	1	0	0	0	0	0	1	.	.	0	IRC
305	Fredericksburg	DBW	1	0	0	0	0	0	0	70	.	0	FARM
306	Spotsylvania	DBW	0	0	0	0	0	0	0	50	1981	0	IRC
307	Stafford	DBW	0	0	0	0	0	0	0	60	1982	0	IRC

Sample#	County	Source	Treatment	Acid Neutralizer	Carbon Filter	Chlorinator	Iron Filter	Sediment Filter	Water Softener	DEPTH	YEAR	Shared	Location
308	Stafford	DBW	0	0	0	0	0	0	0	60	1982	0	IRC
309	Stafford	DW	0	0	0	0	0	0	0	185	1991	0	IRC
310	Stafford	DBW	0	0	0	0	0	0	0	.	.	0	IRC
311	Fredericksburg	DW	1	1	1	0	0	0	0	.	.	0	RRL
312	Fredericksburg	DW	1	0	0	0	1	0	1	220	2011	0	SUB
313	Spotsylvania	DW	0	0	0	0	0	0	0	144	1978	0	FARM
314	Spotsylvania	DW	1	0	1	0	0	1	1	300	2006	0	IRC
315	Fredericksburg	DW	0	0	0	0	0	0	0	.	2003	0	IRC
316	Caroline	DBW	1	0	0	0	0	1	0	50	.	0	RRL
317	Fredericksburg	DBW	0	0	0	0	0	0	0	42	1999	0	IRC
318	Stafford	DW	1	0	0	0	0	0	1	240	2005	0	IRC
319	Fredericksburg	DBW	1	1	0	0	0	1	1	45	1975	0	SUB
320	Fredericksburg	DBW	1	0	0	0	0	1	0	.	1980	0	RRL
321	Westmoreland	DBW	0	0	0	0	0	0	0	80	1960	0	SUB
322	Fredericksburg	DBW	0	0	0	0	0	0	0	.	.	0	SUB
323	Spotsylvania	DW	1	0	0	0	0	0	1	230	2002	0	IRC
324	Spotsylvania	DW	0	0	0	0	0	0	0	.	.	0	SUB
325	Fredericksburg	DBW	0	0	0	0	0	0	0	60	1977	0	SUB
326	Fredericksburg	DBW	1	0	1	0	0	0	0	60	1977	0	SUB
327	Fredericksburg	DBW	1	0	0	0	0	1	0	30	1971	0	IRC
328	Spotsylvania	DW	1	0	0	0	1	0	1	.	.	0	SUB
329	Stafford	DW	1	0	0	0	0	0	1	200	1994	0	SUB
330	Stafford	DBW	0	0	0	0	0	0	0	15	.	0	IRC
331	Stafford	DBW	0	0	0	0	0	0	0	15	.	0	IRC
332	Spotsylvania	DW	1	0	0	0	0	1	0	.	2006	0	SUB
333	Fredericksburg	DW	0	0	0	0	0	0	0	360	2006	0	IRC
334	Fredericksburg	DW	1	1	0	0	1	0	1	360	2006	0	IRC
335	Stafford	DW	1	0	1	0	0	1	0	.	.	0	SUB
336	Spotsylvania	DW	1	1	0	0	0	0	0	225	1984	0	IRC
337	Spotsylvania	DW	1	1	0	0	0	0	0	500	2003	0	IRC
338	Fredericksburg	DBW	1	1	0	0	0	1	0	60	1976	0	SUB
339	Fredericksburg	DBW	1	1	0	0	0	0	1	90	1980	0	IRC
340	Fredericksburg	DBW	0	0	0	0	0	0	0	47	1978	0	IRC
341	Fredericksburg	DW	0	0	0	0	0	0	0	255	1993	0	IRC
342	Fredericksburg	DBW	0	0	0	0	0	0	0	50	1977	0	SUB

Sample#	County	Source	Treatment	Acid Neutralizer	Carbon Filter	Chlorinator	Iron Filter	Sediment Filter	Water Softener	DEPTH	YEAR	Shared	Location
343	Stafford	DW	1	0	0	0	0	1	1	200	1982	0	SUB
344	Fredericksburg	DW	1	1	0	0	1	0	1	245	1994	0	SUB
345	Fredericksburg	DW	0	0	0	0	0	0	0	245	1994	0	SUB
346	Fredericksburg	DW	0	0	0	0	0	0	0	.	2005	0	SUB
347	Fredericksburg	DW	1	0	0	0	0	0	1	.	1984	0	IRC
348	Fredericksburg	DW	0	0	0	0	0	0	0	.	.	0	SUB
349	Fredericksburg	DW	1	0	0	0	1	0	1	.	1989	0	SUB
350	Fredericksburg	DW	1	1	0	0	1	0	1	230	1987	0	SUB
351	Fredericksburg	DW	1	0	0	0	0	0	0	120	1997	0	IRC
352	Orange	DW	1	1	0	0	0	1	0	210	1992	0	RRL
353	Spotsylvania	DBW	0	0	0	0	0	0	0	30	1970	1	IRC
354	Fredericksburg	.	1	0	0	0	0	0	1	.	2004	0	SUB
355	Fredericksburg	DW	1	0	0	0	0	0	1	200	2006	0	SUB
356	Fredericksburg	DBW	0	0	0	0	0	0	0	.	1984	0	IRC
357	Fredericksburg	DW	1	0	1	0	0	1	1	.	2009	0	SUB
358	Fredericksburg	DBW	0	0	0	0	0	0	0	50	1956	0	IRC
359	Fredericksburg	DBW	0	0	0	0	0	0	0	50	1956	0	IRC
360	Fredericksburg	DW	1	0	1	0	0	0	0	.	2002	0	IRC
361	Fredericksburg	DW	1	0	1	0	0	0	0	.	2002	0	IRC
362	Spotsylvania	.	1	0	1	0	0	0	0	.	.	1	SUB
363	Spotsylvania	.	1	0	1	0	0	0	0	.	.	1	SUB
364	Spotsylvania	.	1	0	1	0	0	0	0	.	.	1	SUB
365	Spotsylvania	.	1	0	1	0	0	0	0	.	.	1	SUB
366	Spotsylvania	DBW	0	0	0	0	0	0	0	60	1976	0	IRC
367	Stafford	.	1	0	0	0	0	0	1	40	1974	0	IRC
368	Fredericksburg	DBW	0	0	0	0	0	0	0	40	1989	0	IRC
369	Fredericksburg	DBW	0	0	0	0	0	0	0	40	1989	0	IRC
370	Louisa	DW	1	1	0	0	1	1	1	100	1987	0	IRC
371	Spotsylvania	DW	0	0	0	0	0	0	0	180	1998	0	RRL
372	Spotsylvania	DW	1	0	0	0	0	1	0	280	2011	0	FARM
373	Stafford	DW	0	0	0	0	0	0	0	260	2000	0	IRC
374	Spotsylvania	DBW	0	0	0	0	0	0	0	40	1989	0	IRC
375	Spotsylvania	DBW	0	0	0	0	0	0	0	44	1990	0	IRC
376	Fredericksburg	DBW	0	0	0	0	0	0	0	36	1958	0	SUB
377	King George	DW	0	0	0	0	0	0	0	.	.	1	RRL

Sample#	County	Source	Treatment	Acid Neutralizer	Carbon Filter	Chlorinator	Iron Filter	Sediment Filter	Water Softener	DEPTH	YEAR	Shared	Location
378	Spotsylvania	DW	1	1	0	0	0	1	1	.	.	0	SUB
379	Spotsylvania	DW	1	1	0	0	0	0	1	325	2002	0	SUB
380	Spotsylvania	DBW	0	0	0	0	0	0	0	.	1957	0	RRL
381	Fredericksburg	.	1	0	0	0	0	1	0	260	2006	0	SUB
382	Fredericksburg	.	0	0	0	0	0	0	0	.	.	0	IRC
383	Fredericksburg	DBW	1	1	1	0	0	0	1	62	1987	0	IRC
384	Stafford	DBW	0	0	0	0	0	0	0	.	.	0	SUB
385	Spotsylvania	DW	1	1	0	1	1	0	1	360	2006	0	RRL
386	Spotsylvania	DW	1	1	0	1	1	1	1	360	2006	0	RRL
387	Spotsylvania	DW	1	0	0	0	0	1	0	.	1998	0	SUB
388	Spotsylvania	DW	1	0	0	0	1	0	0	400	2000	0	SUB
389	Spotsylvania	DW	1	0	0	0	1	1	1	300	2000	0	SUB
390	Spotsylvania	DW	1	0	0	0	1	1	1	300	2000	0	SUB
391	Spotsylvania	DW	1	0	0	0	1	0	1	.	2002	0	SUB
392	Spotsylvania	DW	1	0	0	0	1	0	1	.	2002	0	SUB
393	Spotsylvania	DW	0	0	0	0	0	0	0	300	2001	0	IRC
394	Spotsylvania	DW	1	1	0	1	0	0	1	300	2001	0	IRC
395	Spotsylvania	DW	1	0	0	0	1	0	1	600	2002	0	SUB
396	Spotsylvania	DBW	1	0	1	0	0	1	0	30	1978	0	RRL
397	Spotsylvania	DW	0	0	0	0	0	0	0	280	2002	0	IRC
398	Fredericksburg	DBW	0	0	0	0	0	0	0	60	1995	0	RRL
399	Fredericksburg	DBW	0	0	0	0	0	0	0	20	.	0	FARM
400	Fredericksburg	DW	1	0	0	0	0	0	1	250	2007	0	FARM
401	Fredericksburg	DBW	1	1	0	0	0	0	0	60	1985	0	SUB
402	Spotsylvania	DBW	0	0	0	0	0	0	0	.	1987	0	SUB
403	Spotsylvania	DW	1	0	1	1	1	1	1	240	2001	0	SUB
405	Fredericksburg	DBW	0	0	0	0	0	0	0	65	.	0	IRC
406	Spotsylvania	DW	0	0	0	0	0	0	0	.	2005	0	SUB
407	Stafford	DW	1	0	0	0	1	0	1	600	1995	0	SUB
408	Spotsylvania	DW	1	1	0	0	0	0	1	400	2001	0	SUB
409	Fredericksburg	DW	0	0	0	0	0	0	0	300	1996	0	IRC
410	Spotsylvania	DW	1	1	1	0	1	1	0	280	2002	0	IRC
411	Spotsylvania	DW	1	0	0	0	1	0	1	.	1996	0	IRC
412	Fredericksburg	DBW	0	0	0	0	0	0	0	54	1980	0	SUB
413	Spotsylvania	DBW	0	0	0	0	0	0	0	.	1965	0	IRC

Sample#	County	Source	Treatment	Acid Neutralizer	Carbon Filter	Chlorinator	Iron Filter	Sediment Filter	Water Softener	DEPTH	YEAR	Shared	Location
414	Caroline	DW	1	0	0	0	0	1	0	380	1999	0	FARM
415	Fredericksburg	DW	0	0	0	0	0	0	0	.	2004	0	IRC
416	Stafford	DW	1	1	0	0	1	0	1	367	1972	0	RRL
417	Spotsylvania	DBW	0	0	0	0	0	0	0	30	1978	0	RRL
418	Stafford	DW	1	0	0	1	0	0	1	290	2002	0	IRC
419	Fredericksburg	DBW	0	0	0	0	0	0	0	.	1964	0	SUB
420	Spotsylvania	DW	0	0	0	0	0	0	0	.	2007	0	RRL
421	Stafford	DBW	0	0	0	0	0	0	0	40	1960	0	IRC
422	Spotsylvania	DW	1	0	0	0	0	0	0	120	2010	0	IRC
423	Louisa	DW	0	0	0	0	0	0	0	.	2005	0	IRC
424	Spotsylvania	DW	0	0	0	0	0	0	0	360	2005	0	IRC
425	Fredericksburg	DBW	1	0	0	0	0	0	0	50	1973	0	SUB
426	Stafford	DW	1	0	0	0	1	0	1	100	2004	0	IRC
427	Fredericksburg	DBW	0	0	0	0	0	0	0	40	1988	0	IRC
428	Spotsylvania	.	0	0	0	0	0	0	0	.	.	0	IRC
429	Fredericksburg	.	1	1	0	0	0	0	0	.	.	0	SUB
430	Fredericksburg	DW	0	0	0	0	0	0	0	.	2006	0	SUB
431	Spotsylvania	DW	1	1	0	0	1	1	1	165	2003	0	RRL
432	Spotsylvania	DW	0	0	0	0	0	0	0	165	2003	0	RRL
433	Spotsylvania	DBW	0	0	0	0	0	0	0	63	1995	0	SUB
434	Spotsylvania	DBW	0	0	0	0	0	0	0	.	1992	0	IRC
435	Fredericksburg	DBW	0	0	0	0	0	0	0	70	1972	0	SUB
436	Spotsylvania	.	0	0	0	0	0	0	0	.	.	0	SUB
437	Fredericksburg	DBW	0	0	0	0	0	0	0	300	2008	0	RRL
438	Spotsylvania	DW	1	0	0	0	0	0	1	240	1992	0	IRC
439	Spotsylvania	DW	1	0	0	0	0	0	1	.	1997	0	SUB
440	Louisa	DW	0	0	0	0	0	0	0	280	1985	0	IRC
441	Spotsylvania	DW	1	0	0	0	0	0	0	.	1989	0	IRC
442	Spotsylvania	DW	1	1	0	0	1	1	1	300	1994	0	IRC
443	Spotsylvania	DBW	0	0	0	0	0	0	0	52	1974	0	IRC
444	Fredericksburg	DBW	0	0	0	0	0	0	0	20	1979	0	SUB
445	Fredericksburg	DW	1	1	0	0	1	0	1	500	.	0	SUB
446	Fredericksburg	DBW	0	0	0	0	0	0	0	.	.	0	SUB
447	Fredericksburg	DBW	1	1	0	0	0	0	1	.	.	0	SUB
448	Fredericksburg	DW	1	0	0	0	0	0	1	.	.	0	IRC

Sample#	County	Source	Treatment	Acid Neutralizer	Carbon Filter	Chlorinator	Iron Filter	Sediment Filter	Water Softener	DEPTH	YEAR	Shared	Location
449	Fredericksburg	DBW	1	1	0	0	0	0	0	50	1968	0	SUB
450	Stafford	DBW	1	0	1	0	1	0	1	100	2004	0	IRC
451	Stafford	DBW	1	0	0	0	0	0	0	20	1980	0	IRC
452	Spotsylvania	DW	1	0	0	0	1	0	0	270	1994	0	SUB
453	Caroline	DW	1	0	0	0	0	0	1	350	1986	0	IRC
454	Louisa	DW	1	0	0	0	0	1	0	300	2004	0	SUB
455	Spotsylvania	DW	0	0	0	0	0	0	0	270	1994	0	SUB
456	Fredericksburg	DW	1	0	0	0	0	0	0	200	1989	0	IRC
457	Spotsylvania	DW	0	0	0	0	0	0	0	325	1999	0	SUB
458	Fredericksburg	DW	0	0	0	0	0	0	0	280	2000	0	RRL
459	Spotsylvania	DBW	0	0	0	0	0	0	0	.	1970	0	SUB
460	Louisa	DW	1	0	0	0	0	1	0	200	1992	0	RRL
461	Fredericksburg	DBW	1	0	0	0	0	0	1	70	1978	0	SUB
462	Fredericksburg	DW	0	0	0	0	0	0	0	400	2002	0	SUB
463	Spotsylvania	DW	1	0	0	0	0	1	0	290	1991	0	IRC
464	Louisa	DW	1	0	0	0	0	0	0	400	2008	0	IRC
465	Fredericksburg	DW	1	0	0	0	1	0	1	330	2004	0	SUB
466	Fredericksburg	DBW	0	0	0	0	0	0	0	85	1975	0	IRC
467	Louisa	DW	1	0	0	0	0	0	1	500	1984	0	FARM
468	Spotsylvania	DW	0	0	0	0	0	0	0	165	1999	0	SUB
469	Fredericksburg	DBW	1	1	0	0	0	0	0	50	1977	0	IRC
470	Spotsylvania	DW	1	0	0	0	0	0	0	300	.	0	IRC
471	Spotsylvania	DBW	0	0	0	0	0	0	0	.	1982	0	IRC
472	Stafford	DBW	0	0	0	0	0	0	0	40	1977	0	IRC
473	Stafford	DW	1	1	0	0	0	0	1	.	1983	0	SUB
474	Spotsylvania	DW	1	1	0	0	0	0	1	.	1994	0	SUB
475	Fredericksburg	DBW	0	0	0	0	0	0	0	.	1976	0	SUB
476	Stafford	DW	1	0	0	0	1	0	1	.	2007	0	SUB
477	Fredericksburg	DW	1	0	0	0	0	0	1	360	2003	0	SUB
478	Fredericksburg	DBW	1	0	0	0	0	1	0	60	1974	0	RRL
479	Spotsylvania	DBW	0	0	0	0	0	0	0	50	1986	0	IRC
480	Spotsylvania	DW	0	0	0	0	0	0	0	.	2006	0	IRC
481	Stafford	DW	1	0	1	0	1	0	1	.	2007	0	SUB
482	King George	DBW	0	0	0	0	0	0	0	25	1940	0	RRL
483	King George	DW	0	0	0	0	0	0	0	400	2004	0	RRL

Sample#	County	Source	Treatment	Acid Neutralizer	Carbon Filter	Chlorinator	Iron Filter	Sediment Filter	Water Softener	DEPTH	YEAR	Shared	Location
484	Stafford	.	0	0	0	0	0	0	0	.	.	0	FARM
485	Fredericksburg	DBW	1	1	0	0	0	1	0	35	1972	0	IRC
486	Fredericksburg	DW	1	1	1	0	0	0	1	165	1985	0	SUB
487	Fredericksburg	DBW	0	0	0	0	0	0	0	40	1956	0	RRL
488	Fredericksburg	DW	1	0	0	0	0	1	0	600	2004	0	IRC
489	Fredericksburg	DW	1	0	0	0	0	0	1	.	1985	0	SUB
490	Louisa	DBW	1	0	0	0	0	0	1	.	1988	0	IRC
491	Fredericksburg	DW	1	0	0	0	0	1	0	225	1984	0	SUB
492	Caroline	DBW	0	0	0	0	0	0	0	60	1968	0	IRC
493	Spotsylvania	DW	1	0	0	0	0	0	1	.	.	0	IRC
494	Fauquier	DBW	1	0	0	0	0	1	1	.	1988	0	IRC
495	Spotsylvania	DW	1	0	0	1	0	1	1	300	2001	0	IRC
496	Spotsylvania	.	1	0	0	0	0	0	1	.	1995	0	SUB
497	Louisa	DW	1	0	0	0	0	1	0	.	.	0	RRL
498	Spotsylvania	DW	1	0	0	0	0	0	1	345	2005	0	IRC
499	Spotsylvania	DW	1	0	1	0	0	1	0	250	2002	0	IRC
500	Stafford	DBW	1	1	1	0	1	1	1	60	.	0	IRC
501	Stafford	DBW	0	0	0	0	0	0	0	.	.	0	IRC
502	Louisa	DW	0	0	0	0	0	0	0	.	2009	0	IRC
503	Stafford	DBW	0	0	0	0	0	0	0	60	1989	0	IRC
504	Stafford	DW	1	0	0	0	1	0	1	.	2007	0	SUB
505	Caroline	DBW	0	0	0	0	0	0	0	20	.	0	FARM
506	Fredericksburg	.	1	1	0	0	1	0	1	360	2006	0	IRC
507	Spotsylvania	DW	1	1	0	0	0	0	0	.	2007	0	RRL
508	Spotsylvania	DBW	1	0	0	0	0	1	0	.	.	0	IRC
509	Fredericksburg	.	1	0	0	0	0	0	1	.	.	0	IRC
510	Fredericksburg	.	0	0	0	0	0	0	0	.	2009	0	IRC
511	Fredericksburg	DBW	0	0	0	0	0	0	0	50	1984	0	IRC
512	Fredericksburg	DW	1	1	0	0	0	0	1	500	2007	0	SUB
513	Louisa	DW	1	0	0	0	0	1	0	365	2006	0	IRC
514	Fredericksburg	DBW	1	0	1	0	0	0	1	25	1978	0	IRC
515	Louisa	DW	1	0	0	0	0	0	0	265	1998	0	IRC
516	Spotsylvania	DW	1	0	0	0	0	0	1	.	2001	0	SUB
517	Louisa	DW	1	0	0	0	0	0	1	.	.	0	IRC
518	Spotsylvania	DW	1	0	0	0	1	0	0	.	.	0	IRC

Sample#	County	Source	Treatment	Acid Neutralizer	Carbon Filter	Chlorinator	Iron Filter	Sediment Filter	Water Softener	DEPTH	YEAR	Shared	Location
519	Spotsylvania	DW	1	1	0	0	1	0	1	320	2007	0	SUB
520	Louisa	DW	1	0	0	0	0	1	0	.	.	0	SUB
521	Fredericksburg	DBW	1	0	1	0	0	0	1	25	1978	0	IRC
522	Fredericksburg	DW	1	0	0	0	0	0	1	100	.	0	RRL
523	Fredericksburg	DW	0	0	0	0	0	0	0	150	.	0	IRC
524	Fredericksburg	DBW	0	0	0	0	0	0	0	35	1988	0	SUB
525	Spotsylvania	DBW	0	0	0	0	0	0	0	30	1985	0	RRL
526	Louisa	DW	1	0	0	0	0	1	0	200	1984	0	SUB
527	Stafford	DBW	0	0	0	0	0	0	0	55	1980	0	IRC
528	Fredericksburg	DW	1	0	0	0	0	1	0	600	2006	0	IRC
529	Fredericksburg	DW	0	0	0	0	0	0	0	205	1994	0	RRL
530	Spotsylvania	DW	0	0	0	0	0	0	0	600	2005	0	SUB
531	Spotsylvania	DW	1	0	0	0	0	1	1	600	2005	0	SUB
532	Fredericksburg	DW	1	1	0	0	1	1	1	220	1990	0	IRC
533	Spotsylvania	.	0	0	0	0	0	0	0	.	1996	0	SUB
534	Louisa	DBW	0	0	0	0	0	0	0	.	.	0	IRC
535	Fredericksburg	DW	1	0	0	0	0	1	0	400	1994	0	SUB
536	Louisa	DW	0	0	0	0	0	0	0	35	1963	0	RRL
537	Spotsylvania	.	1	0	0	0	0	0	1	.	1994	0	RRL
538	Spotsylvania	DW	0	0	0	0	0	0	0	.	1973	0	RRL
539	Fredericksburg	.	1	1	0	0	1	1	0	.	.	0	SUB
540	Louisa	DBW	0	0	0	0	0	0	0	35	1982	0	RRL
541	Fredericksburg	DW	1	1	0	0	0	1	1	300	2002	0	SUB
542	Spotsylvania	DW	1	0	0	0	0	1	0	180	1997	0	SUB
543	Fredericksburg	.	1	0	1	0	0	0	1	.	.	0	IRC
544	Spotsylvania	DBW	0	0	0	0	0	0	0	50	1965	0	FARM
545	Spotsylvania	.	0	0	0	0	0	0	0	.	1996	0	SUB
546	Fredericksburg	DBW	0	0	0	0	0	0	0	20	1940	0	RRL
547	Spotsylvania	DW	0	0	0	0	0	0	0	460	2008	0	RRL
548	Spotsylvania	DW	1	0	0	0	1	0	0	.	.	0	RRL
549	Fredericksburg	DBW	0	0	0	0	0	0	0	.	.	0	SUB
550	Spotsylvania	DW	0	0	0	0	0	0	0	.	1988	0	RRL
551	Spotsylvania	DW	0	0	0	0	0	0	0	.	2003	0	IRC
552	Spotsylvania	DW	0	0	0	0	0	0	0	.	2009	0	IRC
553	Spotsylvania	DW	0	0	0	0	0	0	0	.	.	0	IRC

Sample#	County	Source	Treatment	Acid Neutralizer	Carbon Filter	Chlorinator	Iron Filter	Sediment Filter	Water Softener	DEPTH	YEAR	Shared	Location
554	Spotsylvania	DBW	0	0	0	0	0	0	0	.	.	0	RRL
555	Spotsylvania	DW	0	0	0	0	0	0	0	.	2004	0	RRL
556	Spotsylvania	DW	1	0	0	0	0	1	1	.	2004	0	RRL
557	Spotsylvania	.	0	0	0	0	0	0	0	.	.	0	IRC
558	Stafford	DBW	0	0	0	0	0	0	0	.	.	0	IRC
559	Fredericksburg	DW	1	0	0	0	1	0	0	400	2003	0	SUB
560	Spotsylvania	DBW	0	0	0	0	0	0	0	34	1991	0	RRL
561	Spotsylvania	DBW	0	0	0	0	0	0	0	40	1972	0	IRC
562	Spotsylvania	DW	0	0	0	0	0	0	0	165	1992	0	IRC
563	Fredericksburg	.	0	0	0	0	0	0	0	.	1990	0	IRC
564	Louisa	DW	1	0	0	0	0	0	1	170	1981	0	IRC
565	Fredericksburg	DW	0	0	0	0	0	0	0	210	2005	0	RRL
566	Stafford	DW	0	0	0	0	0	0	0	265	2002	0	SUB
569	Spotsylvania	DBW	1	0	0	0	0	1	0	40	.	0	RRL

Table B5. Water Characteristics (Taste, Odor, Color)

Sample#	TASTE	BITTER	SULFUR	SALTY	METTALIC	OILY	SOAPY	ODOR	SULFUR	KEROSENE	MUSTY	CHEM	COLOR	MUDDY	MILKY	BLACK	YELLOW	OILY
1	1	1	1	0	0	0	0	1	1	0	0	0	1	1	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	1	0	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0
25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Sample#	TASTE	BITTER	SULFUR	SALTY	METTALIC	OILY	SOAPY	ODOR	SULFUR	KEROSENE	MUSTY	CHEM	COLOR	MUDDY	MILKY	BLACK	YELLOW	OILY
33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
43	0	0	0	0	0	0	0	1	1	0	0	0	1	0	0	0	1	0
44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
46	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
47	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
51	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
52	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
53	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0
54	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
55	1	0	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0
56	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
57	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
58	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
59	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
60	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0
61	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
62	1	0	0	1	0	0	0	1	1	0	0	0	0	0	0	0	0	0
63	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
64	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
65	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0
66	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0
67	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Sample#	TASTE	BITTER	SULFUR	SALTY	METTALIC	OILY	SOAPY	ODOR	SULFUR	KEROSENE	MUSTY	CHEM	COLOR	MUDDY	MILKY	BLACK	YELLOW	OILY
68	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
69	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
70	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0
71	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
72	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
73	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
74	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
75	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
76	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
77	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
78	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
79	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
81	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0
82	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
83	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
84	1	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0
85	1	0	1	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0
86	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
87	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
88	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
89	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
90	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
92	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
93	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
94	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
95	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
96	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
97	1	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0
98	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
101	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Sample#	TASTE	BITTER	SULFUR	SALTY	METTALIC	OILY	SOAPY	ODOR	SULFUR	KEROSENE	MUSTY	CHEM	COLOR	MUDDY	MILKY	BLACK	YELLOW	OILY
102	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
103	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
104	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
105	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0
106	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
107	1	0	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0
108	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
109	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
110	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
111	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
112	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
113	1	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0
114	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0
115	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
116	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0
117	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
118	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
119	1	0	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0
120	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
121	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
122	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
123	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
124	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
125	1	0	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0
126	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
127	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0
128	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
129	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
130	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0
131	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
132	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
133	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0
134	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Sample#	TASTE	BITTER	SULFUR	SALTY	METTALIC	OILY	SOAPY	ODOR	SULFUR	KEROSENE	MUSTY	CHEM	COLOR	MUDDY	MILKY	BLACK	YELLOW	OILY
135	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
136	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0
137	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
138	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
139	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
140	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
141	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
142	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
143	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
144	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
145	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
146	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
147	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
148	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
149	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
150	1	0	1	0	0	0	0	1	1	0	0	0	1	0	0	1	0	0
151	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
152	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
153	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
154	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
155	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
156	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
157	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	1
158	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
159	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0
160	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
161	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0
162	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0
163	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
164	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
165	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
166	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
167	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Sample#	TASTE	BITTER	SULFUR	SALTY	METTALIC	OILY	SOAPY	ODOR	SULFUR	KEROSENE	MUSTY	CHEM	COLOR	MUDDY	MILKY	BLACK	YELLOW	OILY
168	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
169	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
180	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0
181	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
182	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
183	0	0	0	0	0	0	0	1	0	0	1	0	1	0	0	0	0	0
184	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
185	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
186	1	0	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0
187	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
188	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
189	1	0	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0
190	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0
191	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
192	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
193	1	0	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0
194	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
195	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
205	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
206	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0
207	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0
208	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
209	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
210	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
211	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
212	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
213	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
214	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
215	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
216	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0
217	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0
218	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0
219	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Sample#	TASTE	BITTER	SULFUR	SALTY	METTALIC	OILY	SOAPY	ODOR	SULFUR	KEROSENE	MUSTY	CHEM	COLOR	MUDDY	MILKY	BLACK	YELLOW	OILY
220	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0
221	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
222	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
223	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0
224	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0
225	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
226	1	0	0	0	1	0	0	1	1	0	0	0	0	0	0	0	0	0
227	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
228	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0
229	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
236	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
237	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
238	1	0	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0
239	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
240	1	1	1	0	0	0	0	1	0	0	0	1	1	0	0	0	1	0
241	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0
242	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
243	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
244	0	0	0	0	0	0	0	1	1	0	0	0	1	0	0	0	1	0
245	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
246	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
247	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
248	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0
249	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
250	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
251	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
252	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0
253	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0
254	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
255	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
256	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0
257	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1
258	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Sample#	TASTE	BITTER	SULFUR	SALTY	METTALIC	OILY	SOAPY	ODOR	SULFUR	KEROSENE	MUSTY	CHEM	COLOR	MUDDY	MILKY	BLACK	YELLOW	OILY
259	1	0	0	0	1	0	0	0	0	0	0	0	1	1	0	0	0	0
260	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
261	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
262	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0
263	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
264	1	0	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0
265	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
266	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
267	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
268	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
269	1	0	1	0	1	0	0	1	0	0	0	1	0	0	0	0	0	0
270	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
271	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
272	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
273	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
274	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
275	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
276	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
277	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
278	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
279	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
280	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
281	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
282	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
283	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
284	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0
285	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
286	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
287	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
288	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0
289	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
290	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
291	1	0	0	0	1	0	0	1	0	0	1	0	1	0	1	0	1	0

Sample#	TASTE	BITTER	SULFUR	SALTY	METTALIC	OILY	SOAPY	ODOR	SULFUR	KEROSENE	MUSTY	CHEM	COLOR	MUDDY	MILKY	BLACK	YELLOW	OILY
292	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
293	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
294	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
295	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
296	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
297	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
298	1	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	1	0
299	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1
300	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0
301	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
302	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
303	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
304	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
305	1	0	0	0	0	0	0	1	0	0	1	0	1	0	0	0	0	0
306	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
307	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
308	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
309	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
310	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
311	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
312	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
313	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
314	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0
315	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
316	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
317	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
318	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
319	1	0	0	0	0	0	0	1	0	0	0	0	1	1	0	0	0	0
320	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
321	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
322	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
323	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
324	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Sample#	TASTE	BITTER	SULFUR	SALTY	METTALIC	OILY	SOAPY	ODOR	SULFUR	KEROSENE	MUSTY	CHEM	COLOR	MUDDY	MILKY	BLACK	YELLOW	OILY
325	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
326	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
327	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
328	1	0	1	0	0	0	0	1	1	0	0	0	1	0	0	0	0	1
329	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0
330	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
331	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
332	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
333	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0
334	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
335	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
336	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
337	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
338	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
339	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
340	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
341	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
342	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
343	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
344	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
345	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
346	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
347	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
348	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0
349	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0
350	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
351	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
352	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
353	1	0	0	0	1	0	0	1	0	0	1	0	0	0	0	0	0	0
354	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
355	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
356	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
357	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0

Sample#	TASTE	BITTER	SULFUR	SALTY	METTALIC	OILY	SOAPY	ODOR	SULFUR	KEROSENE	MUSTY	CHEM	COLOR	MUDDY	MILKY	BLACK	YELLOW	OILY
358	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0
359	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
360	1	0	1	0	1	0	0	1	1	0	0	0	1	0	0	0	1	0
361	1	0	1	0	0	0	0	1	1	0	0	0	1	0	0	0	1	0
362	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
363	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
364	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
365	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
366	1	0	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0
367	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
368	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
369	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
370	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
371	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
372	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
373	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
374	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
375	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
376	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
377	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0
378	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
379	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
380	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
381	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
382	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
383	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
384	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
385	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0
386	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0
387	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0
388	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
389	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
390	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Sample#	TASTE	BITTER	SULFUR	SALTY	METTALIC	OILY	SOAPY	ODOR	SULFUR	KEROSENE	MUSTY	CHEM	COLOR	MUDDY	MILKY	BLACK	YELLOW	OILY
391	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
392	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
393	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
394	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
395	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
396	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
397	1	0	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0
398	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
399	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0
400	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
401	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
402	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
403	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
405	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
406	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
407	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
408	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
409	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
410	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
411	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0
412	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
413	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
414	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
415	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
416	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
417	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
418	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0
419	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0
420	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
421	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
422	1	0	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0
423	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
424	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0

Sample#	TASTE	BITTER	SULFUR	SALTY	METTALIC	OILY	SOAPY	ODOR	SULFUR	KEROSENE	MUSTY	CHEM	COLOR	MUDDY	MILKY	BLACK	YELLOW	OILY
425	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
426	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
427	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
428	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
429	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
430	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
431	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
432	1	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	1	0
433	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
434	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
435	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
436	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
437	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0
438	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
439	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0
440	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
441	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
442	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
443	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
444	1	0	1	0	1	1	0	1	0	0	1	0	0	0	0	0	0	0
445	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
446	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
447	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
448	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
449	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
450	1	0	1	0	0	0	1	1	1	0	1	0	1	0	0	0	1	0
451	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
452	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
453	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
454	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
455	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
456	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
457	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Sample#	TASTE	BITTER	SULFUR	SALTY	METTALIC	OILY	SOAPY	ODOR	SULFUR	KEROSENE	MUSTY	CHEM	COLOR	MUDDY	MILKY	BLACK	YELLOW	OILY
458	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
459	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
460	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
461	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
462	1	0	1	1	0	0	0	1	1	0	0	0	0	0	0	0	0	0
463	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
464	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
465	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0
466	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
467	1	0	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0
468	1	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
469	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
470	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0
471	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
472	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
473	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
474	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
475	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
476	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0
477	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0
478	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
479	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
480	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
481	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
482	1	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0
483	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
484	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
485	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
486	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
487	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
488	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
489	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
490	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Sample#	TASTE	BITTER	SULFUR	SALTY	METTALIC	OILY	SOAPY	ODOR	SULFUR	KEROSENE	MUSTY	CHEM	COLOR	MUDDY	MILKY	BLACK	YELLOW	OILY
491	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
492	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
493	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
494	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
495	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0
496	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
497	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
498	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
499	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
500	1	1	0	1	0	0	0	1	1	0	0	0	1	0	0	1	1	0
501	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0
502	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
503	1	1	0	0	1	0	0	1	0	0	1	0	1	1	0	0	0	0
504	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
505	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
506	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
507	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
508	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
509	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
510	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
511	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
512	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
513	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
514	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
515	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
516	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
517	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
518	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
519	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
520	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
521	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
522	1	0	0	0	1	0	0	1	1	0	0	0	0	0	0	0	0	0
523	1	1	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0

Sample#	TASTE	BITTER	SULFUR	SALTY	METTALIC	OILY	SOAPY	ODOR	SULFUR	KEROSENE	MUSTY	CHEM	COLOR	MUDDY	MILKY	BLACK	YELLOW	OILY
524	1	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0
525	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
526	0	0	0	0	0	0	0	1	1	0	1	0	0	0	0	0	0	0
527	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
528	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
529	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
530	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0
531	1	0	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0
532	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
533	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
534	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
535	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
536	1	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0
537	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
538	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
539	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
540	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
541	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
542	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
543	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
544	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0
545	1	0	0	0	1	0	0	1	0	0	0	1	1	0	0	0	1	0
546	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
547	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0
548	1	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0
549	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
550	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
551	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
552	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0
553	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
554	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
555	0	0	0	0	0	0	0	1	1	0	1	0	0	0	0	0	0	0
556	0	0	0	0	0	0	0	1	1	0	1	0	0	0	0	0	0	0

Sample#	TASTE	BITTER	SULFUR	SALTY	METTALIC	OILY	SOAPY	ODOR	SULFUR	KEROSENE	MUSTY	CHEM	COLOR	MUDDY	MILKY	BLACK	YELLOW	OILY
557	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
558	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
559	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0
560	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
561	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
562	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0
563	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
564	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
565	1	0	0	0	0	0	0	1	1	0	0	0	1	0	0	0	1	0
566	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0
569	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table B6. Water Characteristics (Stain, Particles)

Sample#	STAIN	BLUE	RUSTY	BLACK	WHITE	PARTICLE	WHITE_FLAKES	BLACK_SPECS	RED_SLIME	BROWN_SEDIMENT
1	1	0	1	0	0	1	0	0	0	1
2	0	0	0	0	0	0	0	0	0	0
3	1	0	0	0	1	0	0	0	0	0
4	1	0	0	0	1	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0
11	1	0	0	0	1	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0
13	1	0	0	0	1	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	1	0	0	0	1
18	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0
20	1	0	1	0	1	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0	0
22	1	0	1	0	1	0	0	0	0	0
23	1	0	1	0	0	1	1	0	0	1
24	1	0	0	0	1	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0	0	0
28	1	0	0	0	1	0	0	0	0	0
29	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0
31	0	0	0	0	0	0	0	0	0	0
32	0	0	0	0	0	0	0	0	0	0

Sample#	STAIN	BLUE	RUSTY	BLACK	WHITE	PARTICLE	WHITE_FLAKES	BLACK_SPECS	RED_SLIME	BROWN_SEDIMENT
33	0	0	0	0	0	0	0	0	0	0
34	1	0	0	0	1	0	0	0	0	0
35	0	0	0	0	0	0	0	0	0	0
36	1	0	0	0	1	0	0	0	0	0
37	1	0	0	0	1	0	0	0	0	0
40	1	0	1	0	0	0	0	0	0	0
41	1	0	1	0	0	0	0	0	0	0
42	0	0	0	0	0	0	0	0	0	0
43	1	0	1	0	0	1	0	0	1	0
44	0	0	0	0	0	0	0	0	0	0
45	1	0	1	0	0	0	0	0	0	0
46	0	0	0	0	0	0	0	0	0	0
47	0	0	0	0	0	1	1	0	0	0
48	0	0	0	0	0	0	0	0	0	0
49	0	0	0	0	0	0	0	0	0	0
50	0	0	0	0	0	0	0	0	0	0
51	1	0	1	0	0	0	0	0	0	0
52	1	0	1	0	0	0	0	0	0	0
53	1	0	1	0	0	0	0	0	0	0
54	0	0	0	0	0	0	0	0	0	0
55	0	0	0	0	0	0	0	0	0	0
56	1	0	0	0	1	0	0	0	0	0
57	0	0	0	0	0	0	0	0	0	0
58	1	0	1	0	0	0	0	0	0	0
59	0	0	0	0	0	0	0	0	0	0
60	0	0	0	0	0	0	0	0	0	0
61	0	0	0	0	0	0	0	0	0	0
62	1	0	1	0	0	0	0	0	0	0
63	1	0	1	0	0	0	0	0	0	0
64	0	0	0	0	0	0	0	0	0	0
65	0	0	0	0	0	0	0	0	0	0
66	0	0	0	0	0	0	0	0	0	0
67	0	0	0	0	0	0	0	0	0	0

Sample#	STAIN	BLUE	RUSTY	BLACK	WHITE	PARTICLE	WHITE_FLAKES	BLACK_SPECS	RED_SLIME	BROWN_SEDIMENT
68	0	0	0	0	0	0	0	0	0	0
69	0	0	0	0	0	0	0	0	0	0
70	1	0	1	0	0	0	0	0	0	0
71	0	0	0	0	0	1	0	0	0	0
72	1	0	0	0	1	1	1	0	0	0
73	0	0	0	0	0	0	0	0	0	0
74	1	0	0	0	1	0	0	0	0	0
75	0	0	0	0	0	0	0	0	0	0
76	1	0	1	0	0	1	0	0	0	1
77	0	0	0	0	0	0	0	0	0	0
78	0	0	0	0	0	0	0	0	0	0
79	0	0	0	0	0	0	0	0	0	0
80	0	0	0	0	0	0	0	0	0	0
81	0	0	0	0	0	0	0	0	0	0
82	0	0	0	0	0	0	0	0	0	0
83	0	0	0	0	0	0	0	0	0	0
84	0	0	0	0	0	0	0	0	0	0
85	1	0	1	0	0	0	0	0	0	0
86	0	0	0	0	0	0	0	0	0	0
87	0	0	0	0	0	0	0	0	0	0
88	1	0	1	0	1	1	1	0	0	0
89	0	0	0	0	0	0	0	0	0	0
90	0	0	0	0	0	0	0	0	0	0
92	1	1	0	0	1	0	0	0	0	0
93	0	0	0	0	0	0	0	0	0	0
94	0	0	0	0	0	0	0	0	0	0
95	0	0	0	0	0	0	0	0	0	0
96	0	0	0	0	0	0	0	0	0	0
97	1	0	0	0	1	0	0	0	0	0
98	0	0	0	0	0	0	0	0	0	0
99	1	0	0	1	0	0	0	0	0	0
100	1	0	0	0	1	0	0	0	0	0
101	0	0	0	0	0	0	0	0	0	0

Sample#	STAIN	BLUE	RUSTY	BLACK	WHITE	PARTICLE	WHITE_FLAKES	BLACK_SPECS	RED_SLIME	BROWN_SEDIMENT
102	1	0	0	0	1	0	0	0	0	0
103	1	0	1	0	1	0	0	0	0	0
104	0	0	0	0	0	0	0	0	0	0
105	1	1	0	0	1	1	0	0	0	0
106	0	0	0	0	0	0	0	0	0	0
107	1	0	1	0	1	0	0	0	0	0
108	1	0	0	0	1	0	0	0	0	0
109	0	0	0	0	0	0	0	0	0	0
110	0	0	0	0	0	0	0	0	0	0
111	1	1	1	0	0	0	0	0	0	0
112	0	0	0	0	0	0	0	0	0	0
113	1	1	1	0	1	0	0	0	0	0
114	1	0	1	0	0	0	0	0	0	0
115	0	0	0	0	0	0	0	0	0	0
116	0	0	0	0	0	0	0	0	0	0
117	1	0	1	0	0	0	0	0	0	0
118	0	0	0	0	0	1	1	0	0	0
119	1	0	1	0	0	0	0	0	0	0
120	1	1	1	0	0	0	0	0	0	0
121	1	0	0	0	1	0	0	0	0	0
122	0	0	0	0	0	0	0	0	0	0
123	1	1	0	0	0	0	0	0	0	0
124	1	0	0	0	0	0	0	0	0	0
125	0	0	0	0	0	0	0	0	0	0
126	0	0	0	0	0	0	0	0	0	0
127	1	0	0	0	1	0	0	0	0	0
128	1	0	0	0	0	0	0	0	0	0
129	1	0	1	0	0	1	0	0	0	1
130	0	0	0	0	0	0	0	0	0	0
131	0	0	0	0	0	0	0	0	0	0
132	1	0	1	0	1	0	0	0	0	0
133	1	0	0	0	1	0	0	0	0	0
134	1	0	1	0	0	0	0	0	0	0

Sample#	STAIN	BLUE	RUSTY	BLACK	WHITE	PARTICLE	WHITE_FLAKES	BLACK_SPECS	RED_SLIME	BROWN_SEDIMENT
135	1	0	0	1	0	0	0	0	0	0
136	1	0	1	1	0	1	0	1	0	0
137	0	0	0	0	0	1	0	1	0	0
138	1	0	0	0	1	0	0	0	0	0
139	0	0	0	0	0	0	0	0	0	0
140	1	0	1	0	0	1	0	0	0	1
141	1	0	0	0	1	0	0	0	0	0
142	0	0	0	0	0	0	0	0	0	0
143	1	0	0	0	0	0	0	0	0	0
144	0	0	0	0	0	0	0	0	0	0
145	1	1	1	0	0	0	0	0	0	0
146	0	0	0	0	0	0	0	0	0	0
147	0	0	0	0	0	0	0	0	0	0
148	0	0	0	0	0	0	0	0	0	0
149	1	0	0	0	1	0	0	0	0	0
150	1	0	1	0	0	0	0	0	0	0
151	0	0	0	0	0	0	0	0	0	0
152	0	0	0	0	0	0	0	0	0	0
153	1	0	0	0	0	0	0	0	0	0
154	0	0	0	0	0	0	0	0	0	0
155	0	0	0	0	0	0	0	0	0	0
156	0	0	0	0	0	0	0	0	0	0
157	1	0	1	0	0	0	0	0	0	0
158	1	1	0	0	0	1	1	0	0	0
159	1	0	1	0	0	0	0	0	0	0
160	1	0	1	0	0	0	0	0	0	0
161	1	0	0	0	0	0	0	0	0	0
162	1	0	0	0	1	1	0	0	0	0
163	0	0	0	0	0	0	0	0	0	0
164	1	1	0	0	0	0	0	0	0	0
165	0	0	0	0	0	0	0	0	0	0
166	0	0	0	0	0	0	0	0	0	0
167	0	0	0	0	0	0	0	0	0	0

Sample#	STAIN	BLUE	RUSTY	BLACK	WHITE	PARTICLE	WHITE_FLAKES	BLACK_SPECS	RED_SLIME	BROWN_SEDIMENT
168	0	0	0	0	0	0	0	0	0	0
169	1	0	0	0	1	1	1	0	0	0
180	0	0	0	0	0	0	0	0	0	0
181	1	0	1	0	0	0	0	0	0	0
182	1	0	0	0	1	0	0	0	0	0
183	1	0	1	0	0	0	0	0	0	0
184	0	0	0	0	0	0	0	0	0	0
185	1	0	1	0	0	0	0	0	0	0
186	0	0	0	0	0	0	0	0	0	0
187	0	0	0	0	0	0	0	0	0	0
188	1	1	0	0	0	1	1	0	0	0
189	0	0	0	0	0	0	0	0	0	0
190	0	0	0	0	0	0	0	0	0	0
191	0	0	0	0	0	0	0	0	0	0
192	0	0	0	0	0	0	0	0	0	0
193	0	0	0	0	0	0	0	0	0	0
194	1	1	0	0	0	0	0	0	0	0
195	1	0	1	0	0	0	0	0	0	0
205	0	0	0	0	0	1	1	0	0	0
206	1	0	0	0	1	0	0	0	0	0
207	0	0	0	0	0	0	0	0	0	0
208	1	1	0	0	0	0	0	0	0	0
209	0	0	0	0	0	0	0	0	0	0
210	1	1	0	0	0	0	0	0	0	0
211	0	0	0	0	0	1	1	0	0	0
212	1	0	0	0	0	0	0	0	0	0
213	0	0	0	0	0	0	0	0	0	0
214	0	0	0	0	0	0	0	0	0	0
215	1	0	1	1	0	0	0	0	0	0
216	0	0	0	0	0	0	0	0	0	0
217	1	0	1	0	0	0	0	0	0	0
218	1	0	1	0	0	1	0	0	0	1
219	1	1	0	0	0	1	1	0	0	0

Sample#	STAIN	BLUE	RUSTY	BLACK	WHITE	PARTICLE	WHITE_FLAKES	BLACK_SPECS	RED_SLIME	BROWN_SEDIMENT
220	1	0	1	0	0	1	0	0	0	0
221	0	0	0	0	0	0	0	0	0	0
222	0	0	0	0	0	0	0	0	0	0
223	0	0	0	0	0	0	0	0	0	0
224	1	0	0	1	0	0	0	0	0	0
225	1	1	0	0	0	0	0	0	0	0
226	0	0	0	0	0	0	0	0	0	0
227	1	1	0	0	0	0	0	0	0	0
228	0	0	0	0	0	1	0	0	0	0
229	0	0	0	0	0	0	0	0	0	0
236	0	0	0	0	0	1	0	1	0	0
237	0	0	0	0	0	0	0	0	0	0
238	1	0	1	0	0	0	0	0	0	0
239	1	1	1	0	0	0	0	0	0	0
240	1	0	1	0	0	1	0	0	1	0
241	0	0	0	0	0	0	0	0	0	0
242	1	0	1	0	0	0	0	0	0	0
243	1	1	0	0	0	0	0	0	0	0
244	1	0	1	0	0	1	0	0	1	0
245	0	0	0	0	0	0	0	0	0	0
246	0	0	0	0	0	0	0	0	0	0
247	1	0	0	0	1	0	0	0	0	0
248	1	0	1	0	0	1	0	0	0	0
249	1	0	1	0	0	0	0	0	0	0
250	0	0	0	0	0	0	0	0	0	0
251	0	0	0	0	0	0	0	0	0	0
252	0	0	0	0	0	0	0	0	0	0
253	1	0	1	0	0	0	0	0	0	0
254	0	0	0	0	0	0	0	0	0	0
255	1	0	0	0	1	0	0	0	0	0
256	1	0	1	0	0	0	0	0	0	0
257	1	0	1	0	1	1	1	0	0	0
258	1	0	0	1	1	1	1	0	0	0

Sample#	STAIN	BLUE	RUSTY	BLACK	WHITE	PARTICLE	WHITE_FLAKES	BLACK_SPECS	RED_SLIME	BROWN_SEDIMENT
259	1	1	0	0	0	0	0	0	0	0
260	0	0	0	0	0	0	0	0	0	0
261	1	0	0	0	1	0	0	0	0	0
262	0	0	0	0	0	0	0	0	0	0
263	0	0	0	0	0	0	0	0	0	0
264	1	0	1	0	0	0	0	0	0	0
265	0	0	0	0	0	0	0	0	0	0
266	1	0	1	0	0	0	0	0	0	0
267	0	0	0	0	0	0	0	0	0	0
268	1	0	0	0	0	0	0	0	0	0
269	0	0	0	0	0	0	0	0	0	0
270	0	0	0	0	0	0	0	0	0	0
271	1	0	0	0	1	1	1	0	0	0
272	1	1	0	0	0	0	0	0	0	0
273	1	0	1	0	0	1	0	1	0	0
274	1	1	1	0	0	1	0	1	0	0
275	0	0	0	0	0	0	0	0	0	0
276	0	0	0	0	0	1	1	0	0	0
277	0	0	0	0	0	0	0	0	0	0
278	1	0	1	0	0	0	0	0	0	0
279	1	0	1	0	0	0	0	0	0	0
280	0	0	0	0	0	1	0	0	1	0
281	1	1	0	0	0	0	0	0	0	0
282	0	0	0	0	0	0	0	0	0	0
283	0	0	0	0	0	0	0	0	0	0
284	0	0	0	0	0	0	0	0	0	0
285	1	0	1	0	0	0	0	0	0	0
286	0	0	0	0	0	0	0	0	0	0
287	0	0	0	0	0	0	0	0	0	0
288	1	0	1	0	0	0	0	0	0	0
289	0	0	0	0	0	0	0	0	0	0
290	0	0	0	0	0	0	0	0	0	0
291	1	1	0	0	0	1	0	0	0	1

Sample#	STAIN	BLUE	RUSTY	BLACK	WHITE	PARTICLE	WHITE_FLAKES	BLACK_SPECS	RED_SLIME	BROWN_SEDIMENT
292	0	0	0	0	0	0	0	0	0	0
293	1	0	1	0	0	0	0	0	0	0
294	1	1	0	0	0	0	0	0	0	0
295	1	0	1	0	0	0	0	0	0	0
296	1	0	0	0	1	0	0	0	0	0
297	1	0	1	0	0	0	0	0	0	0
298	1	0	0	0	0	0	0	0	0	0
299	1	0	1	0	0	1	0	0	1	0
300	1	0	1	0	0	0	0	0	0	0
301	1	0	1	0	0	0	0	0	0	0
302	0	0	0	0	0	0	0	0	0	0
303	1	0	1	0	0	0	0	0	0	0
304	1	0	0	0	0	0	0	0	0	0
305	1	1	0	0	0	1	1	0	0	0
306	0	0	0	0	0	0	0	0	0	0
307	1	0	1	0	0	0	0	0	0	0
308	1	0	1	0	0	0	0	0	0	0
309	1	1	0	0	0	0	0	0	0	0
310	1	1	0	0	0	1	1	0	0	0
311	0	0	0	0	0	0	0	0	0	0
312	0	0	0	0	0	0	0	0	0	0
313	0	0	0	0	0	0	0	0	0	0
314	0	0	0	0	0	0	0	0	0	0
315	1	0	0	0	1	0	0	0	0	0
316	1	0	1	0	0	0	0	0	0	0
317	0	0	0	0	0	0	0	0	0	0
318	0	0	0	0	0	0	0	0	0	0
319	1	1	1	0	1	0	0	0	0	0
320	0	0	0	0	0	0	0	0	0	0
321	1	1	0	0	0	0	0	0	0	0
322	1	1	0	0	0	0	0	0	0	0
323	0	0	0	0	0	0	0	0	0	0
324	0	0	0	0	0	0	0	0	0	0

Sample#	STAIN	BLUE	RUSTY	BLACK	WHITE	PARTICLE	WHITE_FLAKES	BLACK_SPECS	RED_SLIME	BROWN_SEDIMENT
325	1	1	0	0	0	0	0	0	0	0
326	0	0	0	0	0	0	0	0	0	0
327	1	1	0	0	0	1	1	0	0	0
328	1	0	1	0	0	0	0	0	0	0
329	1	0	1	0	0	0	0	0	0	0
330	0	0	0	0	0	0	0	0	0	0
331	0	0	0	0	0	0	0	0	0	0
332	1	0	1	0	1	0	0	0	0	0
333	1	0	1	0	0	0	0	0	0	0
334	1	0	1	0	0	0	0	0	0	0
335	1	1	0	0	0	1	0	1	0	0
336	0	0	0	0	0	0	0	0	0	0
337	1	0	1	0	0	0	0	0	0	0
338	0	0	0	0	0	0	0	0	0	0
339	1	0	1	0	0	0	0	0	0	0
340	1	1	0	1	1	0	0	0	0	0
341	1	1	0	1	0	0	0	0	0	0
342	1	1	0	0	0	0	0	0	0	0
343	0	0	0	0	0	0	0	0	0	0
344	1	0	1	0	0	0	0	0	0	0
345	1	0	1	0	0	0	0	0	0	0
346	1	1	0	0	0	0	0	0	0	0
347	1	0	1	0	0	0	0	0	0	0
348	1	1	0	0	0	0	0	0	0	0
349	0	0	0	0	0	0	0	0	0	0
350	1	0	1	0	0	0	0	0	0	0
351	1	1	0	0	0	0	0	0	0	0
352	0	0	0	0	0	0	0	0	0	0
353	1	1	0	0	0	0	0	0	0	0
354	0	0	0	0	0	0	0	0	0	0
355	1	0	0	0	1	0	0	0	0	0
356	0	0	0	0	0	0	0	0	0	0
357	0	0	0	0	0	0	0	0	0	0

Sample#	STAIN	BLUE	RUSTY	BLACK	WHITE	PARTICLE	WHITE_FLAKES	BLACK_SPECS	RED_SLIME	BROWN_SEDIMENT
358	1	1	0	0	0	0	0	0	0	0
359	1	1	0	0	0	0	0	0	0	0
360	1	0	1	0	1	1	1	0	1	0
361	1	0	0	0	1	0	0	0	0	0
362	0	0	0	0	0	1	1	0	0	0
363	0	0	0	0	0	1	1	0	0	0
364	0	0	0	0	0	1	1	0	0	0
365	0	0	0	0	0	1	1	0	0	0
366	1	1	0	0	0	0	0	0	0	0
367	0	0	0	0	0	0	0	0	0	0
368	1	0	1	0	0	0	0	0	0	0
369	1	0	1	0	0	0	0	0	0	0
370	0	0	0	0	0	0	0	0	0	0
371	0	0	0	0	0	0	0	0	0	0
372	0	0	0	0	0	0	0	0	0	0
373	0	0	0	0	0	0	0	0	0	0
374	1	1	0	0	0	0	0	0	0	0
375	0	0	0	0	0	0	0	0	0	0
376	1	1	0	0	0	0	0	0	0	0
377	1	0	0	0	0	0	0	0	0	0
378	1	0	1	0	0	0	0	0	0	0
379	0	0	0	0	0	0	0	0	0	0
380	0	0	0	0	0	0	0	0	0	0
381	0	0	0	0	0	0	0	0	0	0
382	0	0	0	0	0	0	0	0	0	0
383	0	0	0	0	0	0	0	0	0	0
384	1	1	0	0	0	0	0	0	0	0
385	1	0	1	1	0	1	1	0	0	0
386	1	0	1	1	0	1	1	0	0	0
387	0	0	0	0	0	0	0	0	0	0
388	0	0	0	0	0	0	0	0	0	0
389	1	0	1	0	0	0	0	0	0	0
390	1	0	1	0	0	0	0	0	0	0

Sample#	STAIN	BLUE	RUSTY	BLACK	WHITE	PARTICLE	WHITE_FLAKES	BLACK_SPECS	RED_SLIME	BROWN_SEDIMENT
391	1	0	1	0	0	0	0	0	0	0
392	1	0	1	0	0	0	0	0	0	0
393	0	0	0	0	0	0	0	0	0	0
394	0	0	0	0	0	0	0	0	0	0
395	0	0	0	0	0	0	0	0	0	0
396	0	0	0	0	0	1	0	0	1	0
397	1	0	1	0	0	0	0	0	0	0
398	1	1	0	0	0	0	0	0	0	0
399	0	0	0	0	0	0	0	0	0	0
400	0	0	0	0	0	0	0	0	0	0
401	0	0	0	0	0	0	0	0	0	0
402	0	0	0	0	0	0	0	0	0	0
403	0	0	0	0	0	0	0	0	0	0
405	0	0	0	0	0	0	0	0	0	0
406	0	0	0	0	0	0	0	0	0	0
407	0	0	0	0	0	0	0	0	0	0
408	1	1	0	0	0	0	0	0	0	0
409	1	1	0	0	0	0	0	0	0	0
410	1	0	1	0	1	0	0	0	0	0
411	0	0	0	0	0	1	1	0	0	0
412	0	0	0	0	0	0	0	0	0	0
413	0	0	0	0	0	0	0	0	0	0
414	1	0	0	0	1	1	0	1	0	0
415	1	1	0	0	0	0	0	0	0	0
416	0	0	0	0	0	0	0	0	0	0
417	0	0	0	0	0	1	0	0	1	0
418	1	0	1	0	0	0	0	0	0	0
419	0	0	0	0	0	0	0	0	0	0
420	1	0	1	0	0	0	0	0	0	0
421	0	0	0	0	0	0	0	0	0	0
422	1	0	1	0	0	0	0	0	0	0
423	1	1	1	0	0	0	0	0	0	0
424	1	1	0	0	0	1	1	0	0	0

Sample#	STAIN	BLUE	RUSTY	BLACK	WHITE	PARTICLE	WHITE_FLAKES	BLACK_SPECS	RED_SLIME	BROWN_SEDIMENT
425	0	0	0	0	0	0	0	0	0	0
426	0	0	0	0	0	0	0	0	0	0
427	1	1	0	0	0	0	0	0	0	0
428	0	0	0	0	0	0	0	0	0	0
429	0	0	0	0	0	0	0	0	0	0
430	0	0	0	0	0	1	0	0	0	1
431	1	0	0	0	0	0	0	0	0	0
432	1	0	1	0	0	1	1	0	0	0
433	0	0	0	0	0	0	0	0	0	0
434	1	1	0	0	0	1	0	0	0	0
435	1	1	0	0	0	0	0	0	0	0
436	0	0	0	0	0	0	0	0	0	0
437	1	0	0	1	0	1	0	1	0	0
438	1	0	1	0	0	0	0	0	0	0
439	1	0	1	0	0	0	0	0	0	0
440	1	0	1	0	0	0	0	0	0	0
441	1	1	1	0	0	0	0	0	0	0
442	1	1	0	0	0	0	0	0	0	0
443	0	0	0	0	0	0	0	0	0	0
444	0	0	0	0	0	1	0	0	0	1
445	1	1	1	0	0	0	0	0	0	0
446	1	1	1	0	0	0	0	0	0	0
447	0	0	0	0	0	0	0	0	0	0
448	1	0	0	1	1	0	0	0	0	0
449	0	0	0	0	0	0	0	0	0	0
450	1	0	1	1	0	0	0	0	0	0
451	1	1	0	0	0	0	0	0	0	0
452	0	0	0	0	0	0	0	0	0	0
453	0	0	0	0	0	0	0	0	0	0
454	1	0	1	0	0	0	0	0	0	0
455	0	0	0	0	0	0	0	0	0	0
456	1	0	1	0	0	0	0	0	0	0
457	0	0	0	0	0	0	0	0	0	0

Sample#	STAIN	BLUE	RUSTY	BLACK	WHITE	PARTICLE	WHITE_FLAKES	BLACK_SPECS	RED_SLIME	BROWN_SEDIMENT
458	0	0	0	0	0	0	0	0	0	0
459	0	0	0	0	0	0	0	0	0	0
460	0	0	0	0	0	0	0	0	0	0
461	0	0	0	0	0	0	0	0	0	0
462	1	0	0	0	1	0	0	0	0	0
463	1	0	1	0	0	0	0	0	0	0
464	0	0	0	0	0	0	0	0	0	0
465	1	0	1	0	0	0	0	0	0	0
466	0	0	0	0	0	0	0	0	0	0
467	1	0	1	0	0	1	0	1	0	0
468	1	1	0	0	0	0	0	0	0	0
469	0	0	0	0	0	0	0	0	0	0
470	1	0	1	0	0	1	1	0	0	0
471	1	1	1	0	0	0	0	0	0	0
472	0	0	0	0	0	0	0	0	0	0
473	1	0	1	0	0	0	0	0	0	0
474	1	1	0	0	1	0	0	0	0	0
475	0	0	0	0	0	0	0	0	0	0
476	1	0	1	0	0	0	0	0	0	0
477	0	0	0	0	0	0	0	0	0	0
478	1	1	0	0	0	0	0	0	0	0
479	1	1	0	0	0	0	0	0	0	0
480	0	0	0	0	0	0	0	0	0	0
481	0	0	0	0	0	0	0	0	0	0
482	0	0	0	0	0	0	0	0	0	0
483	0	0	0	0	0	0	0	0	0	0
484	1	1	1	1	0	0	0	0	0	0
485	0	0	0	0	0	0	0	0	0	0
486	1	1	0	0	0	0	0	0	0	0
487	1	1	0	0	0	0	0	0	0	0
488	0	0	0	0	0	0	0	0	0	0
489	1	1	0	0	0	0	0	0	0	0
490	0	0	0	0	0	1	1	0	0	0

Sample#	STAIN	BLUE	RUSTY	BLACK	WHITE	PARTICLE	WHITE_FLAKES	BLACK_SPECS	RED_SLIME	BROWN_SEDIMENT
491	1	0	0	0	1	0	0	0	0	0
492	0	0	0	0	0	0	0	0	0	0
493	0	0	0	0	0	0	0	0	0	0
494	0	0	0	0	0	0	0	0	0	0
495	1	0	1	0	0	0	0	0	0	0
496	1	1	0	0	0	0	0	0	0	0
497	0	0	0	0	0	0	0	0	0	0
498	0	0	0	0	0	0	0	0	0	0
499	1	0	0	0	1	0	0	0	0	0
500	1	0	1	0	0	1	0	0	0	1
501	0	0	0	0	0	0	0	0	0	0
502	1	0	1	0	0	0	0	0	0	0
503	1	1	1	1	0	1	1	0	0	1
504	0	0	0	0	0	0	0	0	0	0
505	1	0	1	0	0	0	0	0	0	0
506	1	0	1	0	0	0	0	0	0	0
507	0	0	0	0	0	0	0	0	0	0
508	1	0	0	1	1	0	0	0	0	0
509	0	0	0	0	0	0	0	0	0	0
510	0	0	0	0	0	0	0	0	0	0
511	1	1	0	0	0	0	0	0	0	0
512	1	0	0	0	1	0	0	0	0	0
513	1	0	1	0	0	0	0	0	0	0
514	1	1	0	0	0	0	0	0	0	0
515	1	0	1	0	0	1	1	0	0	0
516	1	0	1	1	0	0	0	0	0	0
517	0	0	0	0	0	0	0	0	0	0
518	0	0	0	0	0	0	0	0	0	0
519	1	0	0	0	1	1	0	0	0	0
520	1	0	0	0	0	0	0	0	0	0
521	1	1	0	0	0	1	0	0	0	0
522	1	0	0	1	0	0	0	0	0	0
523	1	0	1	1	0	1	0	0	0	1

Sample#	STAIN	BLUE	RUSTY	BLACK	WHITE	PARTICLE	WHITE_FLAKES	BLACK_SPECS	RED_SLIME	BROWN_SEDIMENT
524	0	0	0	0	0	0	0	0	0	0
525	0	0	0	0	0	0	0	0	0	0
526	0	0	0	0	0	0	0	0	0	0
527	1	1	0	0	0	0	0	0	0	0
528	0	0	0	0	0	0	0	0	0	0
529	0	0	0	0	0	0	0	0	0	0
530	0	0	0	0	0	1	0	1	0	0
531	1	0	1	0	0	1	0	1	0	0
532	1	0	1	0	0	0	0	0	0	0
533	1	0	1	1	1	0	0	0	0	0
534	0	0	0	0	0	0	0	0	0	0
535	0	0	0	0	0	0	0	0	0	0
536	0	0	0	0	0	0	0	0	0	0
537	1	0	1	1	0	0	0	0	0	0
538	1	0	0	0	0	0	0	0	0	0
539	1	1	0	1	0	0	0	0	0	0
540	0	0	0	0	0	0	0	0	0	0
541	0	0	0	0	0	0	0	0	0	0
542	1	0	1	0	0	1	1	0	0	0
543	1	1	1	0	0	0	0	0	0	0
544	0	0	0	0	0	0	0	0	0	0
545	1	0	1	0	0	1	0	1	0	0
546	0	0	0	0	0	0	0	0	0	0
547	1	0	0	0	0	0	0	0	0	0
548	0	0	0	0	0	0	0	0	0	0
549	1	1	0	0	0	0	0	0	0	0
550	0	0	0	0	0	0	0	0	0	0
551	1	0	0	0	0	0	0	0	0	0
552	1	0	0	0	1	0	0	0	0	0
553	1	1	0	1	0	0	0	0	0	0
554	0	0	0	0	0	0	0	0	0	0
555	1	0	1	0	0	0	0	0	0	0
556	1	0	1	0	0	0	0	0	0	0

Sample#	STAIN	BLUE	RUSTY	BLACK	WHITE	PARTICLE	WHITE_FLAKES	BLACK_SPECS	RED_SLIME	BROWN_SEDIMENT
557	1	1	0	0	0	1	0	1	0	0
558	1	1	0	0	0	0	0	0	0	0
559	1	0	1	0	0	0	0	0	0	0
560	0	0	0	0	0	0	0	0	0	0
561	1	0	1	0	0	1	0	0	0	1
562	1	0	1	0	1	0	0	0	0	0
563	0	0	0	0	0	1	0	1	0	0
564	1	0	0	0	1	0	0	0	0	0
565	1	0	1	0	0	1	0	0	0	1
566	1	0	1	0	0	0	0	0	0	0
569	1	1	0	0	0	0	0	0	0	0

Table B7. Local Environmental / External Factors

Sample#	SEPTIC	PIT/PRIVY	CEMETERY	HEAT OIL STORAGE	STREAM POND LAKE	COMPOSTPILE	LAND FILL	ILL DUMP	ACT QUARRY	ABAND QUARRY	COMM UST	GOLF	FRUIT	FARM ANIMAL OPERATION	MANU
1	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0
2	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
3	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0
4	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
5	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0
8	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0
9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	1	0	0	0	0	0	0	0	1	1	0
12	0	0	0	0	1	0	0	0	0	0	0	0	1	1	0
13	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0
14	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
15	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0
16	0	0	0	0	0	0	0	0	0	0	1	0	1	1	0
17	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
18	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
19	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0
20	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
23	1	0	0	1	0	0	0	0	0	0	0	0	1	1	0
24	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0
25	1	0	0	0	1	0	0	0	0	0	0	0	1	1	0
26	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0
27	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0
28	0	0	0	0	1	0	0	0	0	0	0	0	1	1	0
29	1	0	0	1	0	0	0	0	0	0	0	0	1	1	0
30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Sample#	SEPTIC	PIT/PRIVY	CEMETERY	HEAT OIL STORAGE	STREAM POND LAKE	COMPOSTPILE	LAND FILL	ILL DUMP	ACT QUARRY	ABAND QUARRY	COMM UST	GOLF	FRUIT	FARM ANIMAL OPERATION	MANU
32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
33	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0
34	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
35	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0
36	0	0	0	1	1	0	0	0	0	0	0	0	1	1	0
37	1	0	0	0	0	0	0	0	0	0	0	0	1	1	0
40	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
44	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
45	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
46	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0
47	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
48	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
49	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0
50	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0
51	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
52	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
53	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
54	0	0	0	1	0	0	0	0	0	0	0	0	1	1	0
55	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
56	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
57	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0
58	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
59	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
60	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0
61	1	0	0	1	0	0	0	0	0	0	0	0	1	1	0
62	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0
63	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
64	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0

Sample#	SEPTIC	PIT/PRIVY	CEMETERY	HEAT OIL STORAGE	STREAM POND LAKE	COMPOSTPILE	LAND FILL	ILL DUMP	ACT QUARRY	ABAND QUARRY	COMM UST	GOLF	FRUIT	FARM ANIMAL OPERATION	MANU
65	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0
66	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
67	0	0	0	1	0	0	0	0	0	0	0	0	1	1	0
68	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0
69	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0
70	0	0	0	0	0	0	0	0	1	0	0	0	1	1	0
71	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0
72	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
73	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
74	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
75	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
76	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
77	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
78	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0
79	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
81	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
82	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
83	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
84	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
85	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
86	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0
87	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0
88	1	0	0	0	0	0	0	1	0	0	0	0	1	1	0
89	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
90	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
92	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
93	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
94	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0
95	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0
96	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0

Sample#	SEPTIC	PIT/PRIVY	CEMETERY	HEAT OIL STORAGE	STREAM POND LAKE	COMPOSTPILE	LAND FILL	ILL DUMP	ACT QUARRY	ABAND QUARRY	COMM UST	GOLF	FRUIT	FARM ANIMAL OPERATION	MANU
97	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
98	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0
99	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0
100	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
101	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
102	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
103	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0
104	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
105	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
106	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0
107	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0
108	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
109	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
110	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0
111	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0
112	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
113	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0
114	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
115	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
116	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0
117	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0
118	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
119	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
120	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0
121	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
122	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
123	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
124	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
125	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
126	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
127	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0

Sample#	SEPTIC	PIT/PRIVY	CEMETERY	HEAT OIL STORAGE	STREAM POND LAKE	COMPOSTPILE	LAND FILL	ILL DUMP	ACT QUARRY	ABAND QUARRY	COMM UST	GOLF	FRUIT	FARM ANIMAL OPERATION	MANU
128	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
129	1	1	0	0	0	0	0	0	0	0	0	0	0	1	0
130	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0
131	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
132	0	0	0	1	1	0	0	0	0	0	0	0	1	1	0
133	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
134	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
135	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
136	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
137	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
138	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
139	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
140	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
141	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
142	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0
143	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
144	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0
145	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0
146	0	0	0	0	0	0	0	0	0	0	1	0	1	1	0
147	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0
148	0	0	0	1	0	0	0	0	0	0	0	1	0	1	0
149	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
150	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
151	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
152	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
153	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
154	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
155	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
156	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
157	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0
158	0	0	0	0	0	0	1	0	0	0	0	0	1	1	0

Sample#	SEPTIC	PIT/PRIVY	CEMETERY	HEAT OIL STORAGE	STREAM POND LAKE	COMPOSTPILE	LAND FILL	ILL DUMP	ACT QUARRY	ABAND QUARRY	COMM UST	GOLF	FRUIT	FARM ANIMAL OPERATION	MANU
159	0	0	0	0	0	0	0	0	1	0	0	0	1	1	0
160	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0
161	0	0	0	0	0	0	1	1	0	0	0	0	0	1	0
162	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
163	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
164	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
165	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
166	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
167	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
168	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
169	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
180	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
181	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0
182	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
183	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
184	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
185	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0
186	0	0	0	0	1	0	0	0	0	1	0	0	1	1	0
187	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0
188	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
189	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
190	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
191	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0
192	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0
193	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
194	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
195	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
205	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
206	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
207	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
208	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0

Sample#	SEPTIC	PIT/PRIVY	CEMETERY	HEAT OIL STORAGE	STREAM POND LAKE	COMPOSTPILE	LAND FILL	ILL DUMP	ACT QUARRY	ABAND QUARRY	COMM UST	GOLF	FRUIT	FARM ANIMAL OPERATION	MANU
209	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
210	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
211	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
212	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
213	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0
214	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
215	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0
216	0	0	0	1	0	0	0	0	0	0	0	0	1	1	0
217	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
218	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0
219	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0
220	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
221	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0
222	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0
223	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
224	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
225	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
226	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
227	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
228	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
229	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
236	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
237	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
238	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
239	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
240	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0
241	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
242	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
243	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
244	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
245	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Sample#	SEPTIC	PIT/PRIVY	CEMETERY	HEAT OIL STORAGE	STREAM POND LAKE	COMPOSTPILE	LAND FILL	ILL DUMP	ACT QUARRY	ABAND QUARRY	COMM UST	GOLF	FRUIT	FARM ANIMAL OPERATION	MANU
246	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
247	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0
248	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
249	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
250	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
251	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
252	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
253	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
254	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
255	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
256	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
257	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
258	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0
259	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
260	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
261	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
262	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
263	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0
264	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
265	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
266	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
267	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
268	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
269	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
270	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0
271	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
272	1	0	0	0	0	0	0	0	0	0	0	0	1	1	0
273	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
274	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
275	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0
276	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0

Sample#	SEPTIC	PIT/PRIVY	CEMETERY	HEAT OIL STORAGE	STREAM POND LAKE	COMPOSTPILE	LAND FILL	ILL DUMP	ACT QUARRY	ABAND QUARRY	COMM UST	GOLF	FRUIT	FARM ANIMAL OPERATION	MANU
277	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
278	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
279	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
280	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0
281	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
282	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
283	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
284	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0
285	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
286	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
287	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
288	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
289	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
290	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
291	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
292	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
293	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
294	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
295	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
296	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
297	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
298	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
299	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
300	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
301	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
302	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
303	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
304	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
305	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0
306	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
307	1	0	0	0	0	0	0	0	0	0	1	0	0	1	0

Sample#	SEPTIC	PIT/PRIVY	CEMETERY	HEAT OIL STORAGE	STREAM POND LAKE	COMPOSTPILE	LAND FILL	ILL DUMP	ACT QUARRY	ABAND QUARRY	COMM UST	GOLF	FRUIT	FARM ANIMAL OPERATION	MANU
308	1	0	0	0	0	0	0	0	0	0	1	0	0	1	0
309	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
310	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
311	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
312	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
313	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
314	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
315	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0
316	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
317	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0
318	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
319	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
320	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0
321	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
322	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
323	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0
324	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
325	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
326	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
327	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
328	0	0	0	0	1	0	0	1	0	1	0	0	0	0	0
329	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
330	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0
331	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0
332	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0
333	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
334	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
335	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
336	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
337	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
338	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Sample#	SEPTIC	PIT/PRIVY	CEMETERY	HEAT OIL STORAGE	STREAM POND LAKE	COMPOSTPILE	LAND FILL	ILL DUMP	ACT QUARRY	ABAND QUARRY	COMM UST	GOLF	FRUIT	FARM ANIMAL OPERATION	MANU
339	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
340	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0
341	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0
342	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
343	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
344	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
345	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
346	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0
347	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0
348	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
349	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
350	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0
351	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0
352	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
353	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
354	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
355	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
356	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
357	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
358	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
359	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
360	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0
361	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0
362	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
363	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
364	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
365	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
366	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
367	0	0	0	0	0	0	1	0	0	0	0	0	1	1	0
368	1	0	0	0	0	0	0	0	0	0	1	0	0	1	0
369	1	0	0	0	0	0	0	0	0	0	1	0	0	1	0

Sample#	SEPTIC	PIT/PRIVY	CEMETERY	HEAT OIL STORAGE	STREAM POND LAKE	COMPOSTPILE	LAND FILL	ILL DUMP	ACT QUARRY	ABAND QUARRY	COMM UST	GOLF	FRUIT	FARM ANIMAL OPERATION	MANU
370	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
371	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
372	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
373	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
374	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
375	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
376	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0
377	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
378	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
379	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
380	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
381	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
382	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
383	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
384	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
385	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
386	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
387	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
388	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
389	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
390	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
391	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
392	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
393	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
394	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
395	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
396	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0
397	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
398	0	0	0	0	1	0	0	0	0	0	0	0	1	1	0
399	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
400	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0

Sample#	SEPTIC	PIT/PRIVY	CEMETERY	HEAT OIL STORAGE	STREAM POND LAKE	COMPOSTPILE	LAND FILL	ILL DUMP	ACT QUARRY	ABAND QUARRY	COMM UST	GOLF	FRUIT	FARM ANIMAL OPERATION	MANU
401	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
402	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
403	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
405	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
406	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
407	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
408	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
409	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
410	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
411	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
412	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
413	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
414	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0
415	1	0	0	1	0	0	0	0	0	0	0	0	0	1	0
416	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0
417	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0
418	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
419	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
420	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
421	1	0	0	0	1	0	0	0	0	0	1	0	0	1	0
422	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
423	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
424	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
425	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
426	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
427	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
428	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
429	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
430	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
431	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
432	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Sample#	SEPTIC	PIT/PRIVY	CEMETERY	HEAT OIL STORAGE	STREAM POND LAKE	COMPOSTPILE	LAND FILL	ILL DUMP	ACT QUARRY	ABAND QUARRY	COMM UST	GOLF	FRUIT	FARM ANIMAL OPERATION	MANU
433	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
434	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
435	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
436	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
437	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
438	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
439	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
440	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0
441	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
442	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
443	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
444	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
445	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
446	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
447	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0
448	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
449	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0
450	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
451	1	0	0	1	0	0	0	0	0	0	0	0	0	1	0
452	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
453	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
454	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
455	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
456	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
457	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
458	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
459	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
460	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0
461	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0
462	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
463	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Sample#	SEPTIC	PIT/PRIVY	CEMETERY	HEAT OIL STORAGE	STREAM POND LAKE	COMPOSTPILE	LAND FILL	ILL DUMP	ACT QUARRY	ABAND QUARRY	COMM UST	GOLF	FRUIT	FARM ANIMAL OPERATION	MANU
464	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
465	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
466	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
467	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
468	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
469	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0
470	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
471	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
472	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
473	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
474	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
475	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
476	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
477	1	0	0	1	0	0	0	0	0	0	0	0	0	1	0
478	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
479	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
480	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
481	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
482	1	0	0	0	0	0	0	0	0	0	1	0	1	0	0
483	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
484	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0
485	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
486	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
487	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0
488	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
489	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
490	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
491	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
492	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
493	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
494	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Sample#	SEPTIC	PIT/PRIVY	CEMETERY	HEAT OIL STORAGE	STREAM POND LAKE	COMPOSTPILE	LAND FILL	ILL DUMP	ACT QUARRY	ABAND QUARRY	COMM UST	GOLF	FRUIT	FARM ANIMAL OPERATION	MANU
495	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
496	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0
497	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
498	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
499	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
500	1	0	1	1	1	0	1	0	0	0	0	0	0	0	0
501	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
502	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
503	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
504	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
505	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0
506	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
507	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0
508	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
509	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
510	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
511	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
512	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
513	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
514	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0
515	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
516	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
517	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
518	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
519	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
520	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
521	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0
522	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
523	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
524	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
525	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Sample#	SEPTIC	PIT/PRIVY	CEMETERY	HEAT OIL STORAGE	STREAM POND LAKE	COMPOSTPILE	LAND FILL	ILL DUMP	ACT QUARRY	ABAND QUARRY	COMM UST	GOLF	FRUIT	FARM ANIMAL OPERATION	MANU
526	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
527	1	0	0	0	0	0	0	0	0	0	0	1	0	1	0
528	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
529	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
530	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
531	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
532	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
533	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
534	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
535	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
536	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
537	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
538	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
539	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
540	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
541	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
542	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
543	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
544	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0
545	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
546	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0
547	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
548	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
549	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
550	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
551	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
552	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
553	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
554	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
555	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
556	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Sample#	SEPTIC	PIT/PRIVY	CEMETERY	HEAT OIL STORAGE	STREAM POND LAKE	COMPOSTPILE	LAND FILL	ILL DUMP	ACT QUARRY	ABAND QUARRY	COMM UST	GOLF	FRUIT	FARM ANIMAL OPERATION	MANU
557	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
558	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0
559	1	0	0	1	0	0	0	0	0	0	0	0	0	1	0
560	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
561	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
562	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
563	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
564	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
565	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
566	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
569	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0

Table B8. Water System Piping

Sample#	Copper	Steel	Plastic	Lead	Sample#	Copper	Steel	Plastic	Lead	Sample#	Copper	Steel	Plastic	Lead
1	.	.	.	.	33	1	0	0	1	67	1	0	0	0
2	0	0	1	0	34	1	0	0	0	68	0	0	1	0
3	0	1	1	0	35	1	1	0	0	69	1	0	0	0
4	0	0	1	0	36	1	1	1	0	70	1	0	0	0
5	0	0	1	0	37	1	0	1	0	71	.	.	.	.
6	0	0	1	0	40	1	0	0	0	72	1	0	0	0
7	1	1	1	0	41	0	0	1	0	73	1	0	0	0
8	1	0	0	0	42	1	0	0	0	74	1	0	0	0
9	1	0	1	0	43	0	0	1	0	75	.	.	.	.
10	0	0	1	0	44	1	0	0	0	76	1	0	0	0
11	1	0	0	0	45	1	0	0	0	77	0	0	1	0
12	.	.	.	.	46	1	0	0	0	78	1	0	0	0
13	0	0	1	0	47	1	0	0	0	79	1	0	0	0
14	.	.	.	.	48	1	0	0	0	80	1	0	0	0
15	0	1	0	0	49	1	0	0	0	81	0	0	1	0
16	1	1	1	0	50	1	0	0	0	82	1	0	1	0
17	0	0	1	0	51	0	0	1	0	83	0	0	1	0
18	0	1	1	0	52	1	0	0	0	84	0	0	1	0
19	0	1	1	0	53	1	0	0	0	85	0	0	1	0
20	0	1	1	0	54	1	0	0	0	86	0	0	1	0
21	0	0	1	0	55	1	0	0	0	87	1	0	0	0
22	0	1	1	0	56	1	0	0	0	88	1	0	0	0
23	0	0	1	0	57	1	0	0	0	89	0	0	1	0
24	1	0	0	0	58	0	0	1	0	90	1	0	0	0
25	.	.	.	.	59	1	0	0	0	92	1	0	1	0
26	0	0	1	0	60	0	0	1	0	93	0	1	0	0
27	0	0	1	0	61	0	0	1	0	94	1	0	0	0
28	0	0	1	0	62	0	0	1	0	95	1	0	0	0
29	1	0	0	0	63	1	0	0	0	96	0	0	1	0
30	.	.	.	.	64	1	0	0	0	97	1	0	0	0
31	.	.	.	.	65	.	.	.	.	98	0	0	1	0
32	.	.	.	.	66	0	0	1	0	99	1	0	0	0

Sample#	Copper	Steel	Plastic	Lead	Sample#	Copper	Steel	Plastic	Lead	Sample#	Copper	Steel	Plastic	Lead
100	0	1	1	0	133	0	0	1	0	166	1	0	0	0
101	0	0	1	0	134	1	0	0	0	167	0	0	1	0
102	0	0	1	0	135	1	0	0	0	168	.	.	.	.
103	0	0	1	0	136	.	.	.	.	169	1	0	0	0
104	0	0	1	0	137	1	0	0	0	180	1	0	0	0
105	1	1	0	0	138	1	0	0	0	181	0	0	1	0
106	1	1	0	0	139	1	0	0	0	182	0	0	1	0
107	0	0	1	0	140	0	0	1	0	183	0	0	1	0
108	0	1	0	0	141	0	0	1	0	184	1	0	0	0
109	.	.	.	.	142	0	0	1	0	185	1	0	0	0
110	0	1	0	0	143	0	0	1	0	186	0	0	1	0
111	1	0	0	0	144	1	0	0	0	187	1	0	0	0
112	.	.	.	.	145	1	0	1	0	188	0	0	1	0
113	.	.	.	.	146	1	0	0	0	189	0	0	1	0
114	0	0	1	0	147	1	0	0	0	190	0	0	1	0
115	1	0	0	0	148	1	0	0	0	191	1	0	0	0
116	1	0	0	0	149	0	0	1	0	192	1	0	0	0
117	1	0	0	0	150	1	0	0	0	193	0	0	1	0
118	1	0	0	0	151	1	0	0	0	194	0	0	1	0
119	0	0	1	0	152	0	0	1	0	195	0	0	1	0
120	1	0	0	0	153	1	0	0	0	205	1	0	0	0
121	0	0	1	0	154	.	.	.	.	206	0	0	1	0
122	0	0	1	0	155	.	.	.	.	207	0	0	1	0
123	1	0	0	0	156	.	.	.	.	208	0	0	1	0
124	1	0	0	0	157	1	0	0	0	209	1	0	1	0
125	0	0	1	0	158	1	0	0	0	210	1	0	0	0
126	1	0	0	0	159	0	0	1	0	211	0	0	1	0
127	0	0	1	0	160	1	0	0	0	212	0	0	1	0
128	0	0	1	0	161	1	0	0	0	213	0	0	1	0
129	.	.	.	.	162	0	0	1	0	214	0	0	1	0
130	0	0	1	0	163	0	0	1	0	215	0	0	1	0
131	.	.	.	.	164	1	0	0	0	216	0	0	1	0
132	1	0	0	0	165	0	0	1	0	217	1	0	1	0

Sample#	Copper	Steel	Plastic	Lead	Sample#	Copper	Steel	Plastic	Lead	Sample#	Copper	Steel	Plastic	Lead
218	0	0	0	0	257	0	0	1	0	290	1	0	0	0
219	1	0	1	0	258	0	0	1	0	291	1	0	0	0
220	0	0	1	0	259	1	0	1	0	292	0	0	1	0
221	0	0	1	0	260	0	0	1	0	293	0	0	1	0
222	0	0	1	0	261	0	0	1	0	294	1	0	0	0
223	0	0	1	0	262	1	0	0	0	295	0	0	1	0
224	0	0	1	0	263	0	0	1	0	296	1	0	1	0
225	0	0	1	0	264	1	0	0	0	297	0	0	1	0
226	0	0	1	0	265	0	0	1	0	298	0	1	0	0
227	1	1	0	0	266	0	0	1	0	299	1	0	1	0
228	1	0	0	0	267	0	0	1	0	300	0	0	1	0
229	.	.	.	.	268	0	0	1	0	301	0	0	1	0
236	0	0	1	0	269	0	0	1	0	302	1	0	0	0
237	0	0	1	0	270	0	0	1	0	303	0	0	1	0
238	1	0	0	0	271	0	0	1	0	304	1	0	1	0
239	1	0	0	0	272	.	.	.	.	305	1	0	1	0
240	.	.	.	.	273	0	0	1	0	306	1	0	0	0
241	0	0	1	0	274	1	0	0	0	307	0	0	1	0
242	1	0	0	0	275	0	0	1	0	308	0	0	1	0
243	1	0	0	0	276	0	0	1	0	309	1	0	0	0
244	0	0	1	0	277	0	0	1	0	310	1	0	1	0
245	0	0	1	0	278	0	1	1	0	311	1	0	0	0
246	0	0	1	0	279	0	0	1	0	312	0	0	1	0
247	1	0	0	0	280	1	0	0	0	313	1	0	0	0
248	1	0	0	0	281	1	0	1	0	314	1	0	1	0
249	0	0	1	0	282	1	0	1	0	315	0	0	1	0
250	1	0	0	0	283	0	0	1	0	316	0	0	1	0
251	0	0	1	0	284	0	0	1	0	317	0	0	1	0
252	0	0	1	0	285	0	0	1	0	318	0	0	1	0
253	0	0	1	0	286	0	0	1	0	319	1	0	0	0
254	1	0	0	0	287	0	0	1	0	320	1	1	1	0
255	1	0	0	0	288	.	.	.	.	321	1	0	0	0
256	1	0	0	0	289	1	0	0	0	322	1	0	1	0

Sample#	Copper	Steel	Plastic	Lead	Sample#	Copper	Steel	Plastic	Lead	Sample#	Copper	Steel	Plastic	Lead
323	0	0	1	0	356	0	0	1	0	389	0	0	1	0
324	0	0	1	0	357	0	0	1	0	390	0	0	1	0
325	0	0	1	0	358	1	0	1	0	391	0	0	1	0
326	0	0	1	0	359	1	0	1	0	392	0	0	1	0
327	0	0	1	0	360	0	0	1	0	393	1	0	0	0
328	0	0	1	0	361	0	0	1	0	394	1	0	0	0
329	0	0	1	0	362	1	0	0	0	395	1	0	0	0
330	1	0	0	0	363	1	0	0	0	396	0	0	1	0
331	0	0	1	0	364	1	0	0	0	397	0	0	1	0
332	1	0	1	0	365	1	0	0	0	398	1	0	0	0
333	0	0	1	0	366	0	0	1	0	399	0	0	1	0
334	0	0	1	0	367	1	0	0	0	400	0	0	1	0
335	1	0	0	0	368	1	0	0	0	401	1	0	0	0
336	1	0	1	0	369	1	0	0	0	402	0	0	1	0
337	1	0	0	0	370	1	0	0	0	403	1	0	0	0
338	0	0	1	0	371	1	0	0	0	405	0	0	1	0
339	1	0	0	0	372	0	0	1	0	406	0	0	1	0
340	0	0	1	0	373	0	0	1	0	407	0	0	1	0
341	1	0	0	0	374	1	0	0	0	408	0	0	1	0
342	1	0	0	0	375	1	0	0	0	409	0	0	1	0
343	1	0	0	0	376	0	0	1	0	410	0	0	1	0
344	1	0	0	0	377	1	0	1	0	411	1	0	0	0
345	1	0	0	0	378	0	0	1	0	412	0	0	1	0
346	0	0	1	0	379	0	0	1	0	413	1	0	0	0
347	1	0	0	0	380	1	0	1	0	414	0	0	1	0
348	1	0	0	0	381	0	0	1	0	415	1	0	1	0
349	1	0	0	0	382	1	0	0	0	416	1	0	0	0
350	1	0	0	1	383	1	0	1	0	417	0	0	1	0
351	1	0	0	0	384	1	0	0	0	418	0	0	1	0
352	1	0	0	0	385	0	0	1	0	419	1	0	0	0
353	1	1	0	0	386	0	0	1	0	420	0	0	1	0
354	.	.	.	.	387	1	0	1	0	421	0	0	1	0
355	0	0	1	0	388	0	0	1	0	422	0	0	1	0

Sample#	Copper	Steel	Plastic	Lead	Sample#	Copper	Steel	Plastic	Lead	Sample#	Copper	Steel	Plastic	Lead
423	0	0	1	0	456	0	0	1	0	489	1	0	0	0
424	0	0	1	0	457	0	0	1	0	490	1	0	0	0
425	0	0	1	0	458	0	0	1	0	491	1	0	0	0
426	0	0	1	0	459	0	0	1	0	492	1	0	0	0
427	1	0	1	0	460	1	0	0	0	493	0	0	1	0
428	0	0	1	0	461	1	0	0	0	494	.	.	.	.
429	1	0	0	0	462	0	0	1	0	495	0	0	1	0
430	0	0	1	0	463	0	0	1	0	496	1	0	0	0
431	0	0	1	0	464	0	0	1	0	497	0	0	1	0
432	0	0	1	0	465	0	0	1	0	498	0	0	1	0
433	1	0	0	0	466	0	0	1	0	499	0	0	1	0
434	1	0	0	0	467	1	1	0	0	500	1	0	0	0
435	1	0	1	0	468	0	0	1	0	501	0	0	1	0
436	0	0	1	0	469	1	0	0	0	502	.	.	.	.
437	0	0	1	0	470	1	0	1	0	503	0	0	1	0
438	0	0	1	0	471	1	0	1	0	504	1	0	0	0
439	0	1	1	0	472	0	1	0	0	505	0	0	1	0
440	0	0	1	0	473	1	0	0	0	506	0	0	1	0
441	1	0	0	0	474	1	0	0	0	507	0	0	1	0
442	1	0	0	0	475	1	0	1	0	508	0	0	1	0
443	0	0	1	0	476	1	0	0	0	509	1	0	0	0
444	0	0	1	0	477	1	0	0	0	510	0	0	1	0
445	1	0	1	0	478	0	0	1	0	511	0	0	1	0
446	0	0	1	0	479	0	0	1	0	512	0	0	1	0
447	1	0	1	0	480	0	0	1	0	513	0	0	1	0
448	0	0	1	0	481	1	0	0	0	514	0	0	1	0
449	1	0	0	0	482	1	0	0	0	515	1	0	0	0
450	0	0	1	0	483	0	0	1	0	516	0	0	1	0
451	1	0	1	0	484	1	0	1	0	517	1	0	0	0
452	1	0	0	0	485	1	0	1	0	518	1	0	0	0
453	1	0	0	0	486	1	0	0	0	519	0	0	1	0
454	0	0	1	0	487	0	0	1	0	520	1	0	0	0
455	1	0	0	0	488	0	0	1	0	521	1	0	0	0

Sample#	Copper	Steel	Plastic	Lead	Sample#	Copper	Steel	Plastic	Lead
522	0	0	1	0	545	.	.	.	.
523	1	1	0	0	546	0	0	1	0
524	0	0	1	0	547	0	0	1	0
525	.	.	.	.	548	1	0	0	0
526	1	0	1	0	549	1	0	0	0
527	1	0	0	0	550	0	0	1	0
528	0	0	1	0	551	1	0	0	0
529	0	0	1	0	552	0	0	1	0
530	0	0	1	0	553	1	0	0	0
531	0	0	1	0	554	0	0	1	0
532	1	0	1	0	555	0	0	1	0
533	0	0	1	0	556	0	0	1	0
534	0	0	1	0	557	.	.	.	.
535	1	0	0	0	558	1	0	1	0
536	0	0	1	0	559	1	0	0	0
537	1	0	0	0	560	0	0	1	0
538	0	0	1	0	561	0	1	0	0
539	.	.	.	.	562	0	0	1	0
540	0	0	1	0	563	1	0	0	0
541	0	0	1	0	564	1	0	0	0
542	0	0	1	0	565	0	0	1	0
543	1	0	0	0	566	0	0	1	0
544	0	0	1	0	569	1	0	0	0

Table B9. PCA Plating Counts

Sample #	Plate 1 (CFU)	Plate 2 (CFU)	Plate 3 (CFU)	Avg (CFU)
180	TFTC	8.9 E2	8.5 E2	N/A
181	TFTC	TFTC	TFTC	N/A
182	TFTC	TFTC	TFTC	N/A
183	TFTC	TFTC	TFTC	N/A
184	TFTC	TFTC	TFTC	N/A
185	TFTC	TFTC	TFTC	N/A
186	TFTC	TFTC	TFTC	N/A
187	TFTC	TFTC	TFTC	N/A
188	1.0 E3	1.1 E3	1.0 E3	1.0 E3
189	TFTC	TFTC	TFTC	N/A
190	TFTC	TFTC	TFTC	N/A
191	1.8 E3	2.0 E3	2.0 E3	1.9 E3
192	TFTC	3.4 E2	TFTC	N/A
193	TFTC	TFTC	TFTC	N/A
194	TFTC	TFTC	TFTC	N/A
195	TFTC	TFTC	TFTC	N/A
196	TFTC	TFTC	TFTC	N/A
197	TFTC	TFTC	TFTC	N/A
198	TFTC	TFTC	TFTC	N/A
199	5.0 E2	7.5 E2	5.0 E2	5.8 E2
200	6.0 E2	3.5 E2	5.0 E2	4.8 E2
201	TFTC	TFTC	TFTC	N/A
202	TFTC	TFTC	TFTC	N/A
203	TFTC	TFTC	TFTC	N/A
204	TFTC	TFTC	TFTC	N/A
205	7.0 E2	3.0 E2	TFTC	N/A
206	TNTC	4.5 E2	-	N/A
207	TFTC	TNTC	TNTC	N/A
208	TNTC	TNTC	TNTC	N/A
209	TFTC	TFTC	TFTC	N/A
210	TNTC	TFTC	TNTC	N/A
211	TFTC	TFTC	TFTC	N/A
212	TNTC	TNTC	TNTC	N/A
213	6.2 E2	TNTC	7.5 E2	N/A
214	TNTC	TNTC	TNTC	N/A
215	-	-	-	N/A
216	TNTC	TNTC	3.7 E2	N/A
217	TFTC	3.0 E2	TFTC	N/A

Sample #	Plate 1 (CFU)	Plate 2 (CFU)	Plate 3 (CFU)	Avg (CFU)
218	TFTC	3.0 E2	TFTC	N/A
219	TNTC	TNTC	TNTC	N/A
220	TFTC	TNTC	1.3 E3	N/A
221	TNTC	4.1 E2	TNTC	N/A
222	TNTC	TNTC	TNTC	N/A
223	TNTC	TNTC	TNTC	N/A
224	TFTC	TNTC	TNTC	N/A
225	TFTC	TNTC	TFTC	N/A
226	9.5 E2	9.0 E2	7.0 E2	8.5 E2
227	TNTC	TNTC	TNTC	N/A
228	TNTC	TNTC	TNTC	N/A
229	TFTC	TFTC	TFTC	N/A
236	TFTC	-	-	N/A
237	TFTC	-	-	N/A
241	TNTC	-	-	N/A
242	TFTC	-	-	N/A
243	TNTC	-	-	N/A
245	TFTC	-	-	N/A
247	lawn	-	-	N/A
250	3.0 E2	-	-	3.0 E2
253	TFTC	-	-	N/A
257	2.0 E3	-	-	2.0 E3
265	4.6 E2	-	-	4.6 E2
266	TFTC	-	-	N/A
280	lawn	-	-	N/A
282	lawn	-	-	N/A
283	TFTC	-	-	N/A
287	2.2 E3	-	-	2.2 E3
290	lawn	-	-	N/A
292	TFTC	-	-	N/A
295	TFTC	-	-	N/A
298	lawn	-	-	N/A
299	TFTC	-	-	N/A
301	TNTC	-	-	N/A
303	TFTC	-	-	N/A
304	TFTC	-	-	N/A
305	lawn	-	-	N/A
306	lawn	-	-	N/A

Sample #	Plate 1 (CFU)	Plate 2 (CFU)	Plate 3 (CFU)	Avg (CFU)
307	TFTC	-	-	N/A
308	3.0 E2	-	-	3.0 E2
310	lawn	-	-	N/A
313	4.4 E2	-	-	4.4 E2
316	TFTC	-	-	N/A
317	3.7 E2	-	-	3.7 E2
319	lawn	-	-	N/A
322	lawn	-	-	N/A
323	lawn	-	-	N/A
325	TFTC	-	-	N/A
327	5.0 E2	-	-	5.0 E2
330	lawn	-	-	N/A
331	1.3 E3	-	-	1.3 E3
338	lawn	-	-	N/A
340	lawn	-	-	N/A
341	TFTC	-	-	N/A
342	3.2 E2	-	-	3.2 E2
343	1.5 E3	-	-	1.5 E3
350	lawn	-	-	N/A
353	7.1 E2	-	-	7.1 E2
356	TFTC	-	-	N/A
357	TFTC	-	-	N/A
359	lawn	-	-	N/A
367	TFTC	-	-	N/A
368	TNTC	-	-	N/A
369	TNTC	-	-	N/A
372	6.2 E2	-	-	6.2 E2
374	5.5 E2	-	-	5.5 E2
375	2.0 E3	-	-	2.0 E3
376	lawn	-	-	N/A
379	TFTC	-	-	N/A
382	TFTC	-	-	N/A
384	TFTC	-	-	N/A

Table B10. *E. coli* Confirmation (EMB)

Sample #	+ / -
191	+
203	+
228	+
237	+
241	+
266	+
282	+
290	+
298	+
301	+
305	+
306	+
310	+
316	+
319	+
322	+
330	+
331	+
338	+
359	+
367	+
380	+
399	+
405	+
444	+
501	+
527	+
538	+
558	+